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A STUDY OF COMMUNICATIONS IN MONTANA STATE GOVERNMENT

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September 20, 1973

(3)
Fish - D. Shaw

ATTORNEY GENERAL'S OFFICE
HELENA, MONTANA
OCT 5 1973
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TO: Recipients of Communications' Study

FROM: Doyle B. Saxby, Director

SUBJECT: Communications in Montana State Government

Enclosed is a copy of a recent "*Study of Communications in Montana State Government*" that was prepared by the Communications Bureau. The study shows the growth of communications throughout State Government.

Please review this report and notify the Department of Administration's Communications Bureau of any recent changes in the system or inventory.

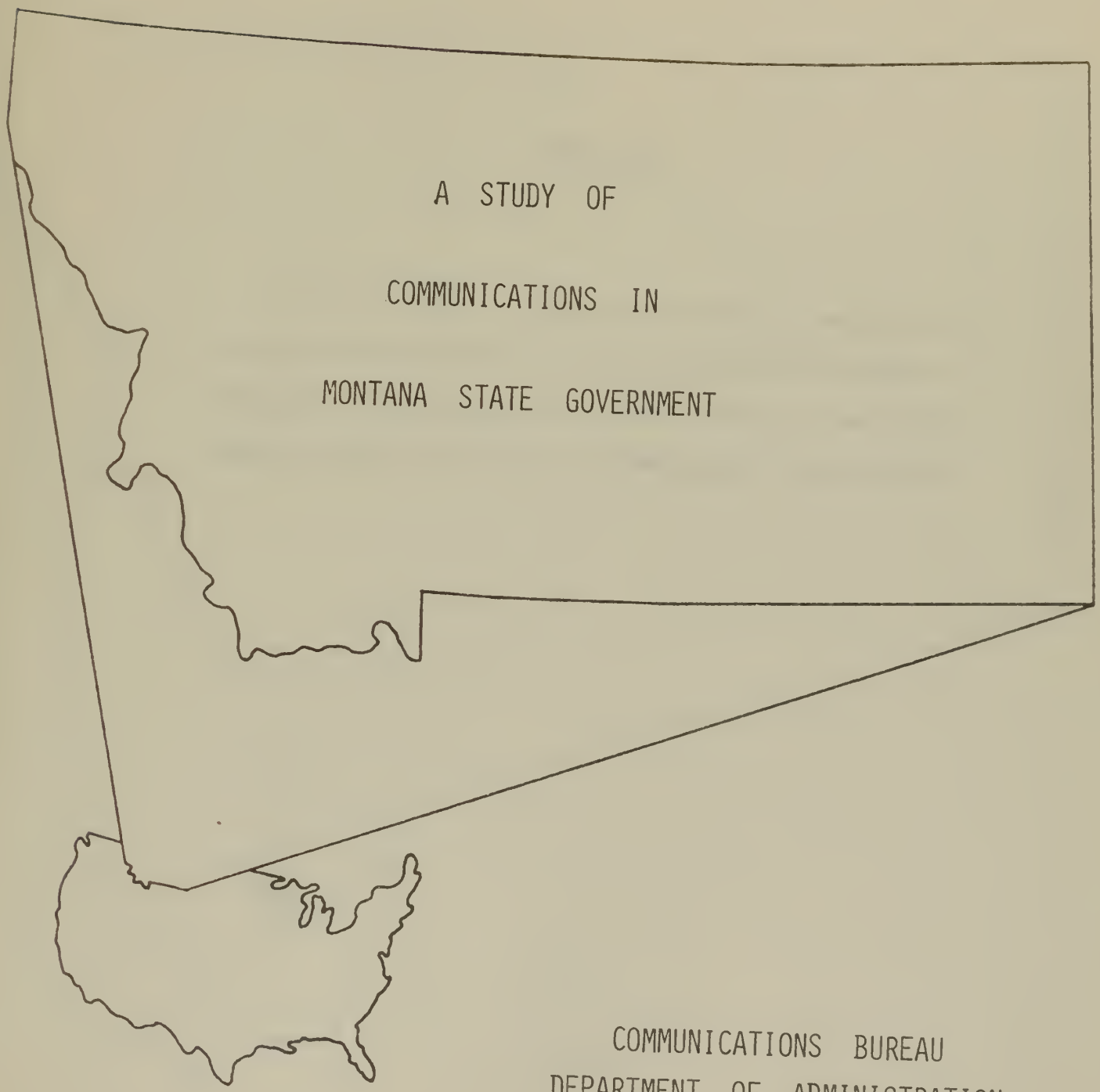
10-3-73

Jerry:

Enclosed is a copy of the study I mentioned during our conversation. This is the first in a series of studies I hope to do, all leading towards a comprehensive Statewide plan and our much needed integrated communications system.

If you have any questions or would like more information please call.

Curt Wheeling
Communications Bureau



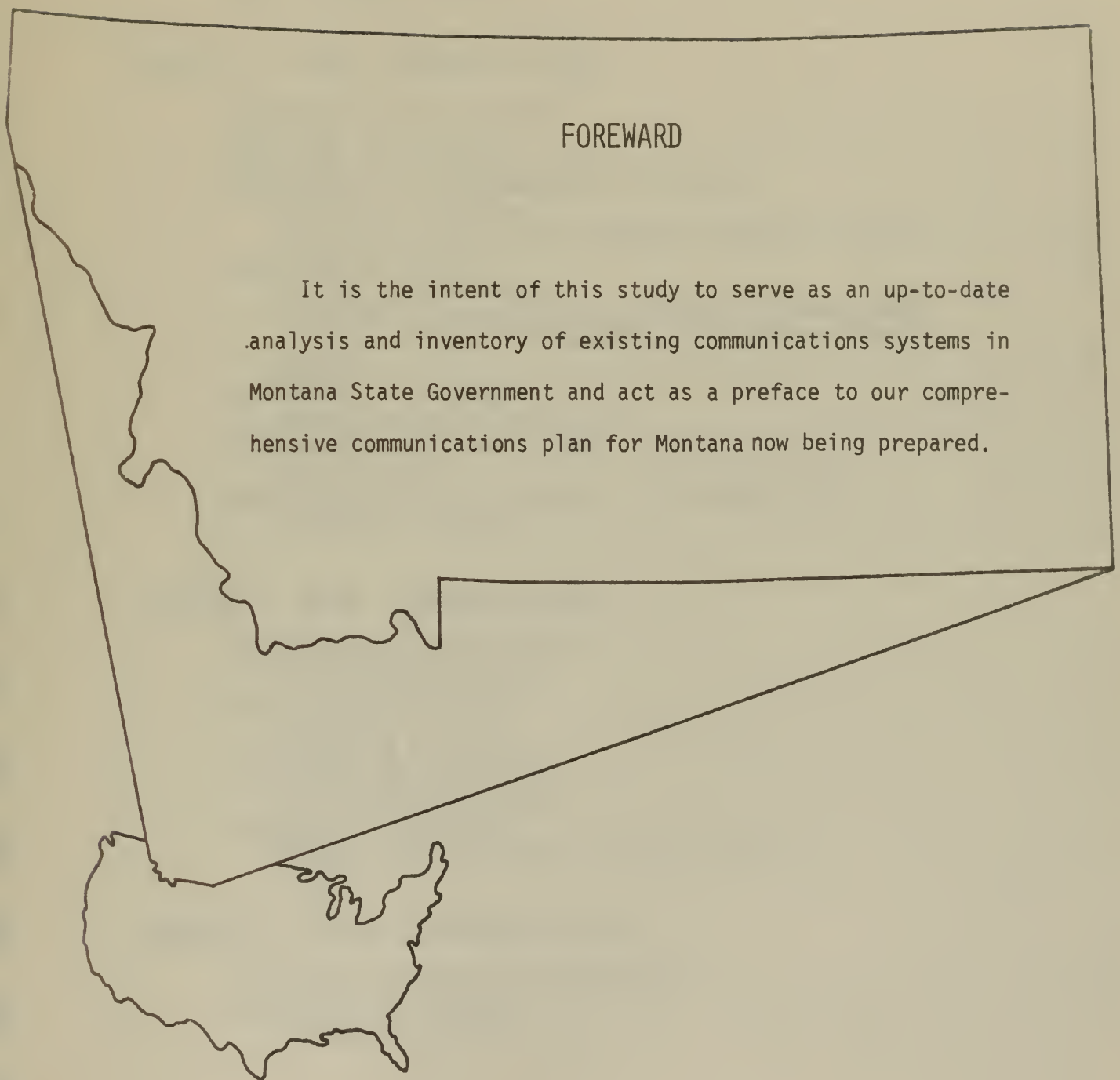
A STUDY OF

COMMUNICATIONS IN

MONTANA STATE GOVERNMENT

COMMUNICATIONS BUREAU
DEPARTMENT OF ADMINISTRATION
HELENA, MONTANA

APRIL, 1973



FOREWARD

It is the intent of this study to serve as an up-to-date analysis and inventory of existing communications systems in Montana State Government and act as a preface to our comprehensive communications plan for Montana now being prepared.

CONTENTS

PAGE

CHAPTER 1 TELEPHONE COMMUNICATIONS

STATE TELEPHONE SYSTEM 1

CHAPTER 2 RADIO COMMUNICATIONS

DEPARTMENT OF FISH AND GAME 9
DEPARTMENT OF HIGHWAYS 11
DEPARTMENT OF INSTITUTIONS 16
DEPARTMENT OF INTERGOVERNMENTAL RELATIONS
AERONAUTICS DIVISION 18
OFFICE OF HIGHWAY SAFETY-EMERGENCY MEDICAL SERVICES 20
DEPARTMENT OF JUSTICE
MONTANA HIGHWAY PATROL 25
REGISTRAR OF MOTOR VEHICLES, MONTANA LAW ENFORCEMENT TELETYPE SYSTEM, FIRE MARSHALLS AND CRIMINAL INVESTIGATORS 32
DEPARTMENT OF LIVESTOCK
BRANDS-ENFORCEMENT DIVISION 33
DEPARTMENT OF MILITARY AFFAIRS
CIVIL DEFENSE 35
DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
DIVISION OF FORESTRY 37

CHAPTER 3 DATA COMMUNICATIONS

DEPARTMENT OF ADMINISTRATION
DATA PROCESSING BUREAU 44
DEPARTMENT OF EDUCATION
UNIVERSITY SYSTEM 45
DEPARTMENT OF HIGHWAYS
COMMUNICATIONS BUREAU 47
DATA PROCESSING BUREAU 49
DEPARTMENT OF JUSTICE
MONTANA LAW ENFORCEMENT TELETYPE SYSTEM 51

CHAPTER 4 VIDEO COMMUNICATIONS

EDUCATIONAL TECHNOLOGY DEMONSTRATION 54
DEPARTMENT OF EDUCATION
UNIVERSITY SYSTEM 57

PAGE

APPENDIX I TELEPHONE COMMUNICATIONS

STS TELEPHONE INVENTORY 59

APPENDIX II RADIO COMMUNICATIONS

EQUIPMENT INVENTORY 78

APPENDIX III DATA COMMUNICATIONS

COMPUTER INVENTORY 90

LIST OF FIGURES

FIGURE PAGE

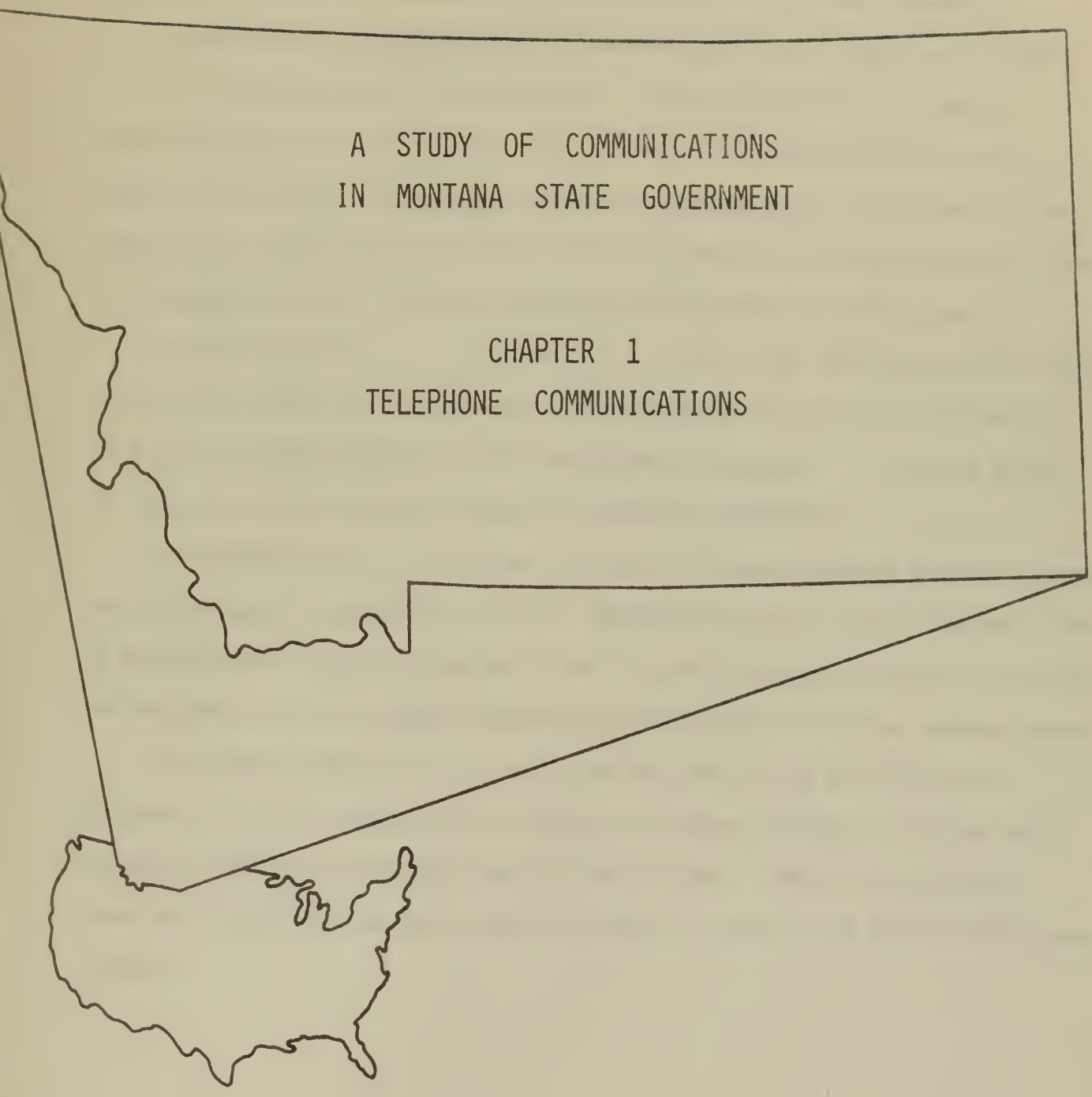
1-1 STATE TELEPHONE SYSTEM USAGE 2
1-2 GROWTH OF THE STATE TELEPHONE SYSTEM 3
1-3 STATE TELEPHONE SYSTEM 6
1-4 STS DIALING INSTRUCTIONS April, 1973 7

2-1 DEPARTMENT OF HIGHWAYS-BASE TO BASE COMMUNICATION LINKS 12
2-2 DEPARTMENT OF HIGHWAYS-BASE STATION LOCATIONS AND RADIO COMMUNICATION COVERAGE 13
2-3 BASIC EMS COMMUNICATION SYSTEM 22
2-4 AMBULANCE SERVICE COMMUNICATIONS 23
2-5 MONTANA LAW ENFORCEMENT COMMUNICATIONS PLAN REGIONAL FREQUENCY ASSIGNMENTS 26
2-6 MONTANA LAW ENFORCEMENT COMMUNICATIONS PLAN LOCAL AND SPECIAL FREQUENCY ASSIGNMENTS 27
2-7 LOCAL LAW ENFORCEMENT BASE STATIONS 29
2-8 MONTANA HIGHWAY PATROL 30
2-9 DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION DIVISION OF FORESTRY-BASE TO BASE COMMUNICATION LINKS 38
2-10 DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION FORESTRY DIVISION -RADIO COMMUNICATION COVERAGE 39
2-11 DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION FORESTRY DIVISION-RADIO COMMUNICATION COVERAGE 40
2-12 DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION FORESTRY DIVISION-RADIO COMMUNICATION COVERAGE 42

3-1 DEPARTMENT OF HIGHWAYS-TELETYPE NETWORK 48
3-2 MONTANA LAW ENFORCEMENT TELETYPE SYSTEM (MLETS) 52

4-1 MONTANA - FAIRCHILD ATS-F SATELLITE "FOOTPRINT" 56

A STUDY OF COMMUNICATIONS IN MONTANA STATE GOVERNMENT



CHAPTER 1
TELEPHONE COMMUNICATIONS

ATTORNEY GENERAL'S OFFICE
HELENA, MONTANA

MOUNTAIN BELL - MONTANA COMMUNICATIONS BUREAU

Audio Visual Presentation/Concept

ALEN

RECEIVED

Mountain Bell in cooperation with the communications bureau, state of Montana, will produce a slide-tape show about the state of Montana's communications resources. This program is intended to give an overview of the statewide communications network and will include not only the telephone network, but also other voice, teletype and data transmission networks.

It is Mountain Bell's intent to show the state communications network as it now exists and how it is being used. The program will be done by Mountain Bell personnel with assistance from the communications bureau. Slides will be taken of persons utilizing the various types of communications tools, also tape recordings will be made of interviews with these people. The tape recordings will be used as a portion of the narrative to the program.

The introduction to the program will be done by the communications bureau and will be included in the narrative. The program will follow, in structure, "A Study of Communications in Montana State Government." It will be a step by step approach to communications in Montana government.

Mountain Bell intends to give a picture of communications in state government showing all systems now in use. Naturally this will include the facilities of Mountain Bell and these will be shown, as will facilities owned by the state and equipment built by various communications and data systems manufacturers.

The voice recordings used in the narrative will have been edited by Mountain Bell with cooperation of participating state agencies, but they will be edited with the above mentioned purpose in mind. The voice recordings used will portray the communications system as it now exists and how it's being utilized.

Mountain Bell will be using this program as employe information. We will be showing our employes what goes into a total communications system and what part our employes play in a system of this type. The state of Montana, communications bureau will be free to use the program in its entirety in any way it sees fit.

INTRODUCTION

The telephone has become an integral part of state government operations. We have come to rely upon this "instant communication" to anywhere in the State and the Nation. During the 1972 National Conference of State Telecommunication Directors, W. B. Sherlock of General Telephone and Electronics addressed the Conference with these opening remarks:

> "The fabric of our society is woven of spoken symbols...words. And we perceive more information than is actually conveyed in the words. The inflection of a voice...its tone...its pace... impart meaning beyond the words themselves."

SYSTEM DESCRIPTION

May of 1963 witnessed the birth of the State Telephone System (STS) with three tie line circuits each from Helena to Missoula, Great Falls, Billings and Bozeman; and three Wide Area Telephone Service (WATS) circuits. In the proposal submitted by Mountain Bell, the increased costs for the "new STS" were justified by the expected reduction in long distance charges.

During 1963 and 1964 STS usage had increased to the point more tie line and WATS circuits had to be added. The frustrations of busy signals were temporarily relieved but soon again became a problem and the STS expanded. This trend has continued to the present; and with each addition to the STS, usage has gradually increased until the System once again operates at maximum capacity. Today the STS is carrying approximately 7,500 calls per day. The problem of busy circuits is as prevalent now as in the early 60's (See figures 1-1 and 1-2).

STATE TELEPHONE SYSTEM USAGE

CALLS PER MONTH, 1963-1973

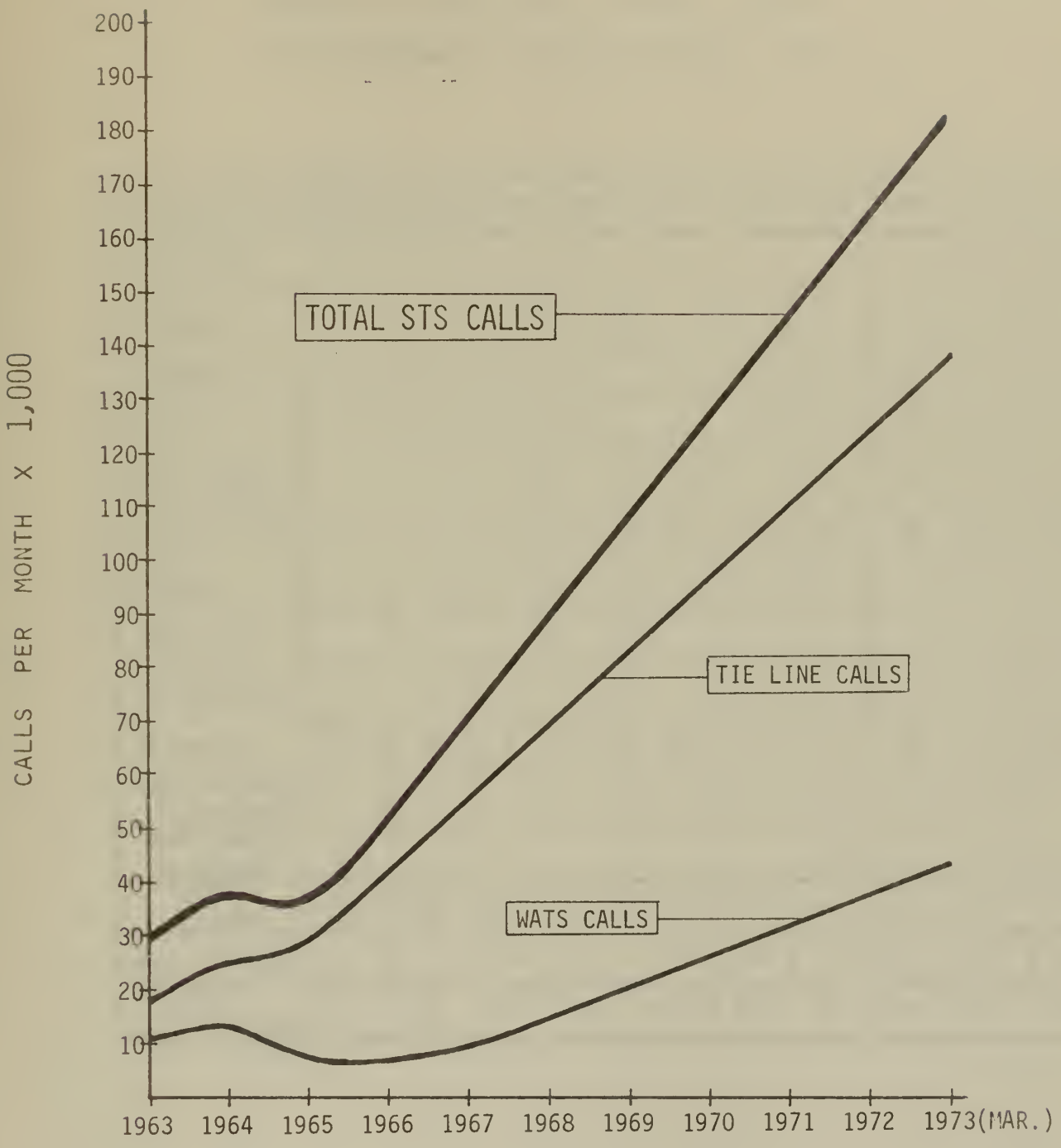


FIGURE 1-1

GROWTH OF THE STATE TELEPHONE SYSTEM

TIE LINE AND WATS CIRCUITS, 1963-April, 1973

HELENA TO:	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Billings	3	3	4	4	5	6	8	8	10	12	12
Boulder							1	1	2	3	3
Bozeman	3	3	4	5	6	7	9	9	12	12	12
Butte		2	3	3	3	3	4	5	6	8	8
Deer Lodge							2	2	3	3	3
Great Falls	3	3	4	4	5	6	8	8	8	10	10
Havre										3	3
Kalispell										3	3
Miles City						2	2	3	4	4	4
Missoula	3	3	4	5	6	7	9	9	9	12	12
Warm Springs (Anaconda)							3	3	3	5	5
Warm Springs to Galen							1	1	1	1	1
Total Tie Lines	12	14	19	21	25	31	47	49	58	76	76
WATS Circuits	3	6	9	11	12	13	15	15	18	20	20
Total STS Circuits	15	20	28	32	37	44	62	64	76	96	96

FIGURE 1-2

From 1963 to 1973, STS usage has increased nearly 500%. The System itself has expanded from the original 12 tie lines and 3 WATS circuits, to the present total of 76 tie lines and 20 WATS circuits; an increase in capability of over 530%. During the past ten years the total number of telephones connected to the STS has increased approximately 475% (from 600 stations in 1963 to approximately 3,450 today).

The actual cost for the STS, including all tie lines, WATS circuits and associated terminal equipment, has increased 270% (from $6,619 per month in 1963 to $24,564 per month in 1973). This is due, in part, to the availability in 1967 of shared-use GSA TELPAK circuits at a substantially lower circuit cost per mile than Mountain Bell. For example, the original STS of 1963 cost the State $6,619 per month; the same circuit configuration using today's TELPAK rates and Mountain Bell tariffs would be $3,734 per month.

Consider also, that the STS did not exist, and all intrastate calls carried by the System had to be placed long distance. Using an average of fifty cents per call, and even if the present total daily calls were reduced by half, monthly long distance charges to the State would exceed $40,000.

With the expansion in State government and the increased need for "instant communication" throughout the State, costs for telephone service and equipment have naturally increased. Of the more than 1.3 million dollars paid annually for telephone communications, STS costs make up less than one-fourth of this total. Local service and equipment charges are the major portion of our telephone expense. Over the past ten years we have seen only one local service and equipment rate increase. However, with the additions of CENTREX units at the Capitol, MSU, U of M and other areas, local service and equipment charges have increased for each location.

Today's STS is the tandem dial network as shown in figure 1-3. Dedicated tie line circuits extend from Helena to twelve outlying areas, and twenty full-period WATS circuits are switched from Helena. All cities served by the STS are accessible to each other by dialing the appropriate access code; WATS circuits are also assigned one, three digit access code. Dialing instructions are presented in figure 1-4.

An inventory, by city and by department, of telephones connected to the STS is given in Appendix I.

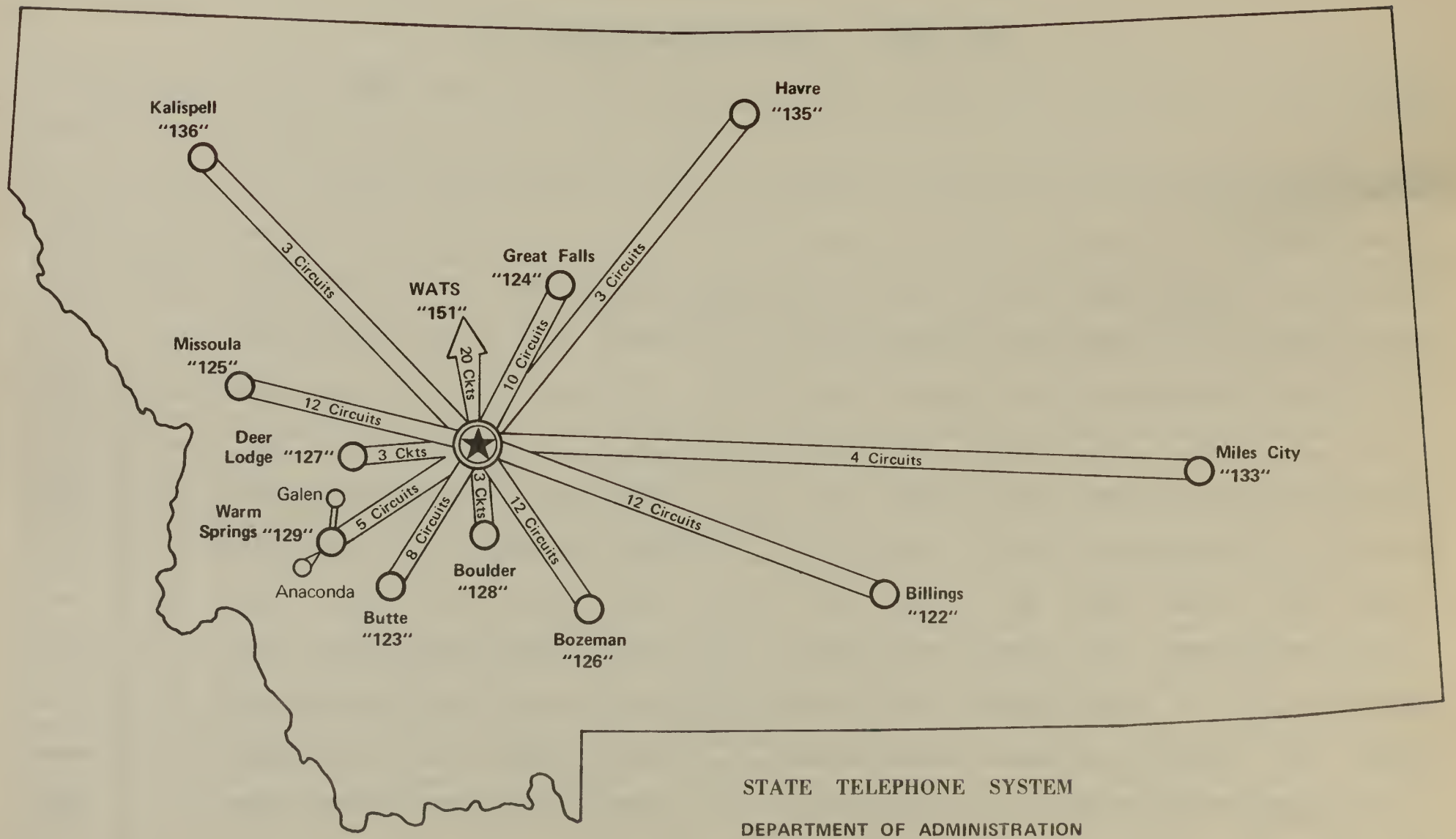

Kalispell
"136"
Havre
"135"
Great Falls
"124"
WATS
"151"
Missoula
"125"
3 Circuits
3 Circuits
20 Ckts
10 Circuits
12 Circuits
Deer
Lodge "127"
3 Ckts
4 Circuits
Miles City
"133"
Galen
Warm
Springs "129"
5 Circuits
8 Circuits
3 Ckts
12 Circuits
12 Circuits
Anaconda
Boulder
"128"
Billings
"122"
Butte
"123"
Bozeman
"126"
STATE TELEPHONE SYSTEM
DEPARTMENT OF ADMINISTRATION
COMMUNICATIONS BUREAU
APRIL, 1973

FIGURE 1-3

STS DIALING INSTRUCTIONS APRIL, 1973

FROM / TO	ANACONDA	BILLINGS	BOULDER SCHOOL	BOZEMAN	BUTTE	DEER LODGE	GALEN	GREAT FALLS	HAVRE	HELENA	KALISPELL	MILES CITY	MISSOULA	WARM SPRINGS
ANACONDA	(7 digits)	8-129-9-(7 digits)	8-129-9-(7 digits)	8-129-9-(7 digits)	8-129-9-(7 digits)	8-129-9-(7 digits)	7-9-(7 digits)	8-129-9-(7 digits)	8-129-9-(7 digits)	129-9-(7 digits)	8-129-9-(7 digits)	8-129-9-(7 digits)	8-129-9-(7 digits)	9-(7 digits)
BILLINGS	Not Available	Ext. No. or 9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	7-8-122-(Ext. No.) or 7-8-122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	122-(Ext. No.) or 122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)	8-122-(Ext. No.) or 8-122-9-(7 digits)
BOULDER SCHOOL	Not Available	8-128-(Ext. No.)	(Ext. No.)	8-128-(Ext. No.)	8-128-(Ext. No.)	8-128-(Ext. No.)	7-8-128-(Ext. No.)	8-128-(Ext. No.)	8-128-(Ext. No.)	128-(Ext. No.)	8-128-(Ext. No.)	8-128-(Ext. No.)	8-128-(Ext. No.)	8-128-(Ext. No.)
BOZEMAN	Not Available	8-126-(Ext. No.) or 8-126-9-(7 digits)	8-128-(Ext. No.) or 8-126-9-(7 digits)	Ext. No. or 9-(7 digits)	8-128-(Ext. No.) or 8-126-9-(7 digits)	8-128-(Ext. No.) or 8-126-9-(7 digits)	7-8-126-(Ext. No.) or 7-8-126-9-(7 digits)	8-126-(Ext. No.) or 8-126-9-(7 digits)	8-126-(Ext. No.) or 8-126-9-(7 digits)	128-(Ext. No.) or 126-9-(7 digits)	8-126-(Ext. No.) or 8-126-9-(7 digits)	8-128-(Ext. No.) or 8-126-9-(7 digits)	8-126-(Ext. No.) or 8-126-9-(7 digits)	8-126-(Ext. No.) or 8-128-9-(7 digits)
BUTTE	Not Available	8-123-(Ext. No.) or 8-123-9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)	Ext. No. or 9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)	7-8-123-(Ext. No.) or 7-8-123-9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)	123-(Ext. No.) or 123-9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)	8-123-(Ext. No.) or 8-123-9-(7 digits)
DEER LODGE	Not Available	8-127-(Ext. No.) or 8-127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)	Ext. No. or 9-(7 digits)	7-8-127-(Ext. No.) or 7-8-127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)	127-(Ext. No.) or 127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)	8-127-(Ext. No.) or 8-127-9-(7 digits)
GALEN	(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	Ext. No. or 7-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	129-7-(Ext. No.) or 129-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	8-129-7-(Ext. No.) or 8-129-9-(7 digits)	7-(Ext. No.) or 9-(7 digits)
GREAT FALLS	Not Available	8-124-(Ext. No.) or 8-124-9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)	7-8-124-(Ext. No.) or 7-8-124-9-(7 digits)	Ext. No. or 9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)	124-(Ext. No.) or 124-9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)	8-124-(Ext. No.) or 8-124-9-(7 digits)
HAVRE	Not Available	8-135-(Ext. No.) or 8-135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)	7-8-135-(Ext. No.) or 7-8-135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)	Ext. No. or 9-(7 digits)	135-(Ext. No.) or 135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)	8-135-(Ext. No.) or 8-135-9-(7 digits)
HELENA	Not Available	8-(Ext. No.) or 8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	7-8-(Ext. No.) or 7-8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	Ext. No. or 9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)	8-(Ext. No.) or 8-9-(7 digits)
KALISPELL	Not Available	8-136-(Ext. No.) or 8-136-9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)	7-8-136-(Ext. No.) or 7-8-136-9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)	136-(Ext. No.) or 136-9-(7 digits)	Ext. No. or 9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)	8-136-(Ext. No.) or 8-136-9-(7 digits)
MILES CITY	Not Available	8-133-(Ext. No.) or 8-133-9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)	7-8-133-(Ext. No.) or 7-8-133-9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)	133-(Ext. No.) or 133-9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)	Ext. No. or 9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)	8-133-(Ext. No.) or 8-133-9-(7 digits)
MISSOULA	Not Available	8-125-(Ext. No.) or 8-125-9-(7 digits)	8-125-(Ext. No.) or 8-125-9-(7 digits)	8-125-(Ext. No.) or 8-125-9-(7 digits)	8-125-(Ext. No.) or 8-125-9-(7 digits)	8-125-(Ext. No.) or 8-125-9-(7 digits)	7-8-125-(Ext. No.) or 7-8-125-9-(7 digits)	8-125-(Ext. No.) or 8-125-9-(7 digits)	8-125-(Ext. No.) or 8-125-9-(7 digits)	126-(Ext. No.) or 129-9-(7 digits)	8-128-(Ext. No.) or 8-125-9-(7 digits)	8-125-(Ext. No.) or 8-125-9-(7 digits)	Ext. No. or 9-(7 digits)	8-125-(Ext. No.) or 8-125-9-(7 digits)
WARM SPRINGS	(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	7-(Ext. No.) or 7-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	128-(Ext. No.) or 128-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	8-128-(Ext. No.) or 8-128-9-(7 digits)	Ext. No. or 9-(7 digits)
WATS	Not Available	8-151-1-(7 digits)	8-151-1-(7 digits)	8-151-1-(7 digits)	8-151-1-(7 digits)	8-151-1-(7 digits)	7-8-151-1-(7 digits)	8-151-1-(7 digits)	8-151-1-(7 digits)	151-1-(7 digits)	8-151-1-(7 digits)	8-151-1-(7 digits)	8-151-1-(7 digits)	8-151-1-(7 digits)

(Ext. No.) - a two, three or four digit state extension number (7 digits) - a seven digit local telephone number

FIGURE 1-4

PLANS AND RECOMMENDATIONS

Since management of the STS was turned over to the Communications Bureau in October of 1972, several measures have been taken to try to alleviate the congestion on the STS and to prevent misuse of the System.

STS usage surveys were taken in order to pinpoint congested tie line areas in the hopes of relieving some of the load on the WATS circuits. For example: In 1972 Havre was added to the STS and more tie line circuits were ordered for Missoula, Kalispell and Billings. However, there are still a tremendous number of WATS calls made to tie line cities.

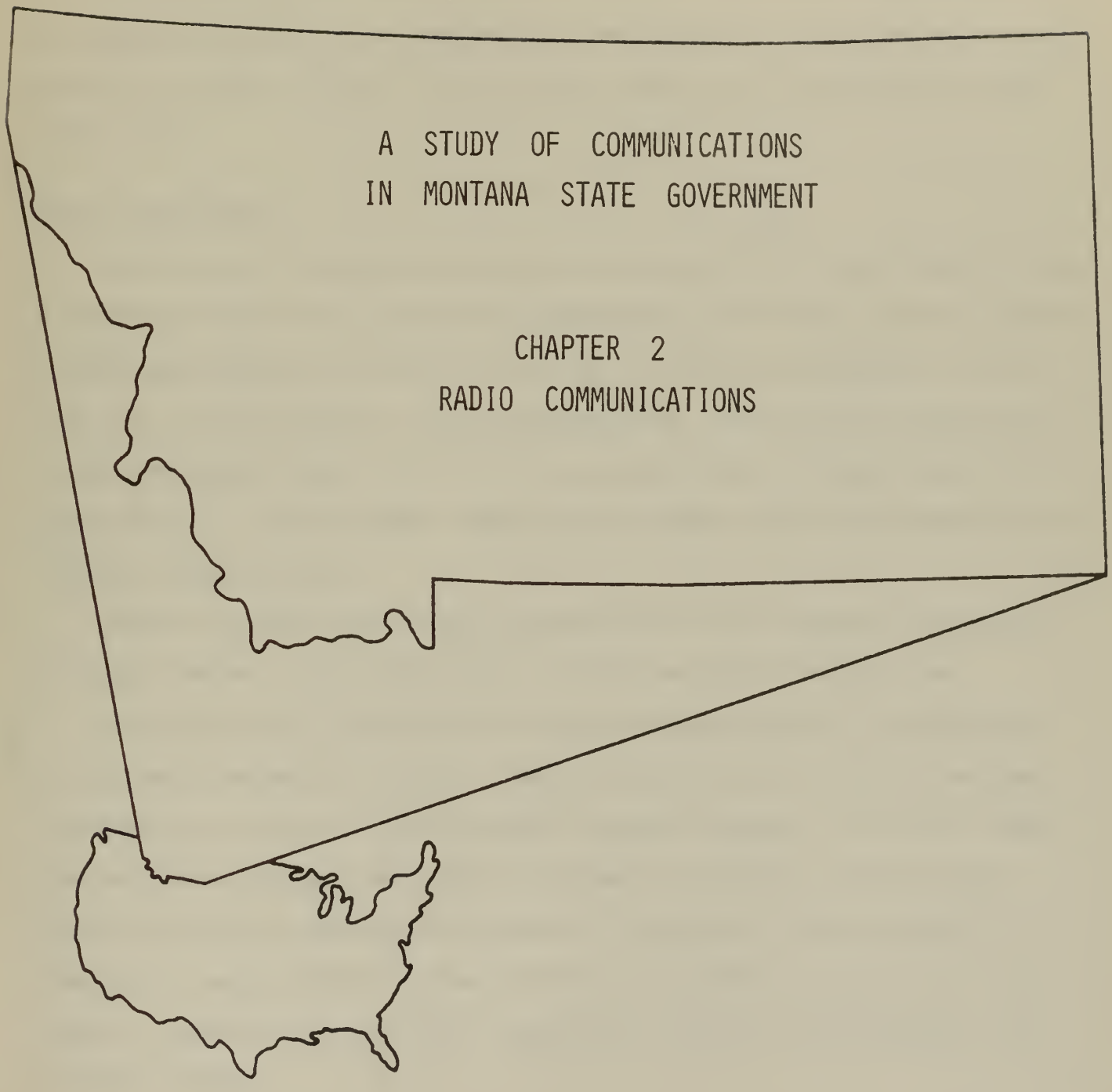
Misuse of the STS is largely due to poor education of its users. Telephone stickers, as shown below, were distributed throughout State government.

HELENA—Dial access code plus ext. no. or access code and "9" plus 7 digits.
OTHERS—Dial "8" plus access code and ext. or "5" plus access code and "9" plus 7 digits.

	Access Code		Access Code		Access Code
ANACONDA	"129"	BUTTE	"123"	KALISPELL	"136"
BILLINGS	"122"	DEER LODGE	"127"	MISSOULA	"125"
BOULDER RIVER SCHOOL	"128"	GREAT FALLS	"124"	MILES CITY	"133"
BOZEMAN	"126"	HAVRE	"135"	WARM SPRINGS	"129"

Several alternatives are under consideration to eliminate misuse of the WATS circuits, and to improve the accounting of WATS usage on a prorated cost per call basis. Technical difficulties have been encountered, but as soon as they are resolved, recommendations will be made.

The Communications Bureau is continually reviewing and surveying the STS in order to improve the level of service. Substantial additions to the tie line network are planned for September, 1973. Investigation is also being made into other network arrangements and central switching equipment.



A STUDY OF COMMUNICATIONS IN MONTANA STATE GOVERNMENT

CHAPTER 2
RADIO COMMUNICATIONS

INTRODUCTION

The Department of Fish and Game has installed two-way radio communication in its vehicles to assist in the completion and enforcement of its duties relating to Montana's wild game and fish, and also in the supervision of our parks and recreational areas.

SYSTEM DESCRIPTION

The Department of Fish and Game relies almost entirely on county and city law enforcement communications systems for dispatching of their mobile units. The Department does operate one base station at the Fish and Game Headquarters in Billings, with limited coverage in the surrounding area. All other activity must be coordinated through county sheriffs or city police units. For a description of county and local law enforcement communications systems, see "Radio Communications - Montana Highway Patrol."

Eighty-eight (88) mobile radio equipped vehicles are assigned for operation throughout Montana. Ten portable units are also available for field use.

Dispatching from county and local law enforcement agencies is carried over the Statewide frequency, 39.82 MHz. Mobile to mobile activity and Fish and Game dispatching are handled on the Department's present frequency, 39.74 MHz. Based upon recommendations from the Electronics Research Laboratory, Montana State University, and the Communications Bureau, the Department of Fish and Game is planning to change frequencies from 39.74 MHz to 39.90 MHz in early 1973. This change of frequency will allow the transmission of administrative messages over the radio network.

Maintenance of the Department's radio communications equipment is generally contracted to the Department of Highways.

A complete radio equipment inventory for the Department of Fish and Game is given in Appendix II.

PLANS AND RECOMMENDATIONS

Plans for improvement of radio communications by the Department of Fish and Game include provisions for establishing base stations in Helena, Missoula and Kalispell; installing more mobile units in boats on larger lakes; and systematically updating present mobile system.

The recommended change in the Departmental frequency will give the mobile radio network added flexibility in operation and enable better utilization of the available low band frequencies.

INTRODUCTION

Montana's many miles of roads and highways, together with our rather frequent inclement weather, require a large force to maintain the State's life-line of transportation. The two-way radio system operated by the Department of Highways is primarily used to coordinate the construction, supervision and maintenance of State highways and bridges in Montana; and secondly for the transmission of administrative messages.

SYSTEM DESCRIPTION

This Department is the only State agency which has implemented a reasonably effective Statewide radio communication network. The Department of Highways is licensed for operation on four low land frequencies; primary - 47.04 MHz, secondary- 47.16 MHz, additional - 47.08 and 47.10 MHz. Several high band frequencies (150 MHz range) are licensed for base station control purposes. Intrastate transmission of messages and mobile dispatching are accomplished by utilizing the thirty (30) base stations located throughout the State. Effective Statewide coverage on the primary frequency has been attained by stratigically locating the base stations and controlling these remote sites via two-way high band radio links; fifteen (15) such links are presently in operation. (See figures 2-1, 2-2).

A total of 436 mobile units and 26 portable units are dispatched on the Department's frequencies throughout the State. Dispatching of mobiles is normally on a 24 hour stand-by basis except when conditions warrant 24 hour continuous operation.

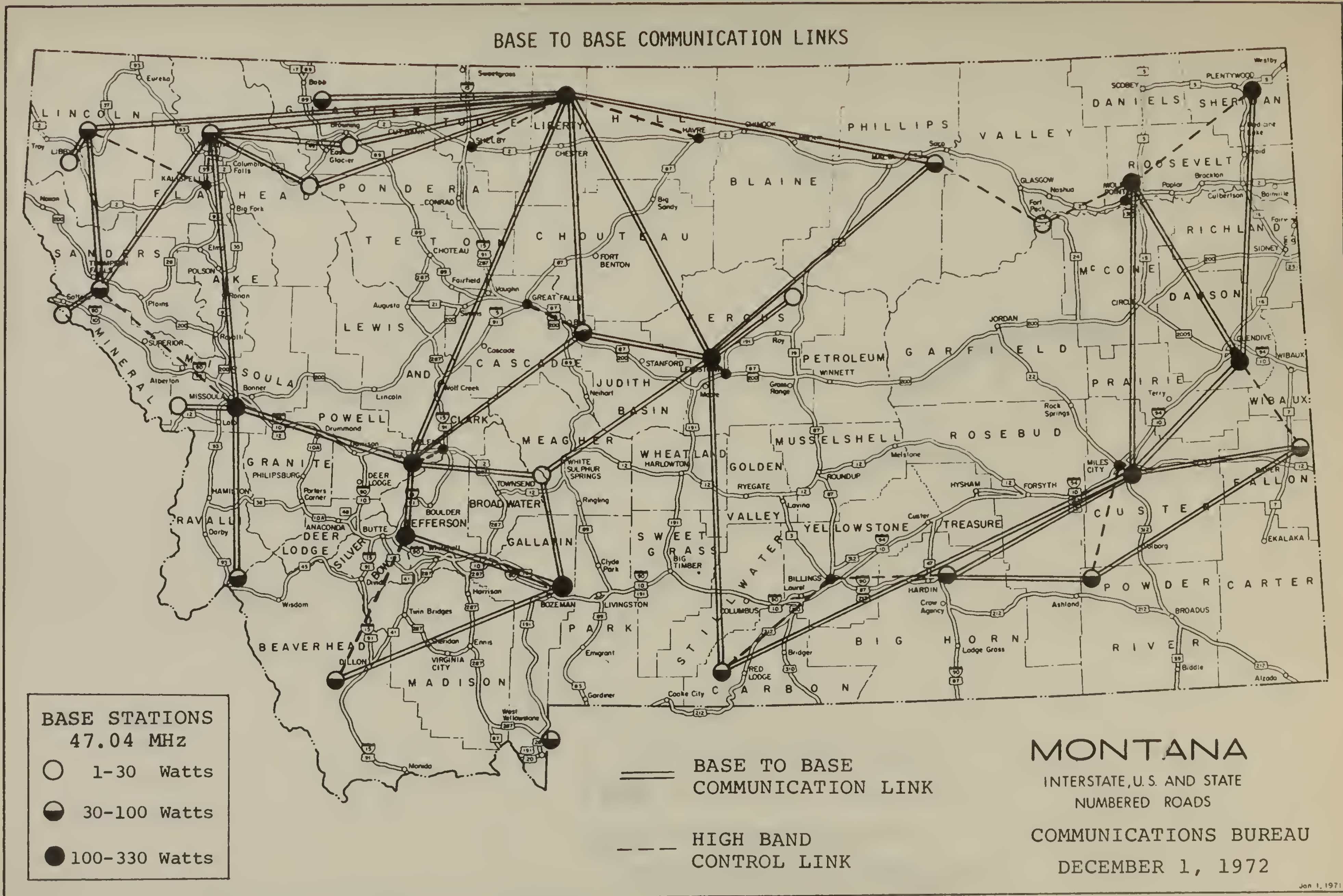
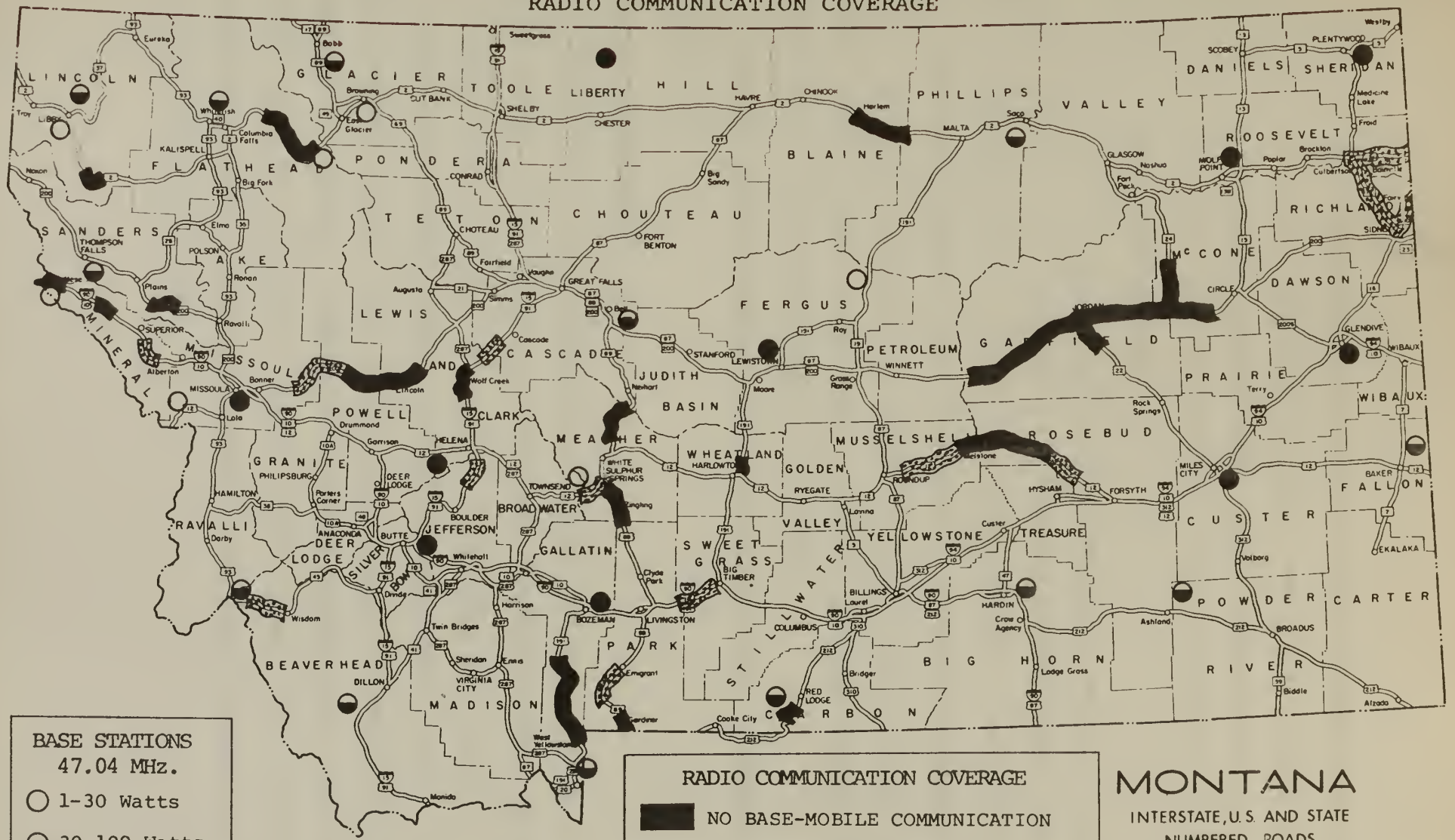

BASE TO BASE COMMUNICATION LINKS
BASE STATIONS
47.04 MHz
1-30 Watts
30-100 Watts
100-330 Watts
BASE TO BASE
COMMUNICATION LINK
HIGH BAND
CONTROL LINK
MONTANA
INTERSTATE, U.S. AND STATE
NUMBERED ROADS
COMMUNICATIONS BUREAU
DECEMBER 1, 1972
Jan 1, 1971

FIGURE 2-1

BASE STATION LOCATIONS AND RADIO COMMUNICATION COVERAGE



BASE STATIONS
47.04 MHz.

- ○ 1-30 Watts
- ◒ 30-100 Watts
- ● 100-330 Watts

RADIO COMMUNICATION COVERAGE

- ■ NO BASE-MOBILE COMMUNICATION
- ▨ INTERMITTENT BASE-MOBILE COMMUNICATION
- * RELIABLE BASE-MOBILE COMMUNICATION ON ALL OTHER ROADS AND HIGHWAYS

MONTANA

INTERSTATE, U.S. AND STATE NUMBERED ROADS

COMMUNICATIONS BUREAU

DECEMBER 1, 1972

Jan 1, 1971

FIGURE 2-2

The Department of Highways operates its own radio equipment maintenance facility centered in Helena. The Helena facility is staffed with a chief, assistant chief, radio technician and radio engineer. Radio engineers are also located at maintenance shops in Kalispell, Great Falls, Billings and Glendive to service equipment in the surrounding areas.

In the event of a major disaster or civil emergency, control of the MacDonald Pass base station can be relocated to the Emergency Operating Center (EOC) at the Civil Defense Headquarters in Helena. At present, Helena is the only location capable of readily dispatching from an assigned EOC. Reliable long duration emergency power is available to only the installations at Mount Royal and Clark Peak. Short duration (battery) power is available to several of the remaining base stations, where low-drain solid state equipment is installed.

A complete radio equipment inventory for the Department of Highways is given in Appendix II.

PLANS AND RECOMMENDATIONS

Future planning by the Department of Highways for improvement of radio communication includes closing the gaps in the present coverage patterns. (See figure 2-2) These plans call for; 1) the location of necessary base stations to improve or provide two-way communication in the Mosby-Brockway area, Superior to the Idaho lines, Gallatin Gateway to West Yellowstone, Livingston to Gardiner and the Glacier Park areas; 2) systematic replacement of old and outdated base, control, mobile and portable units; 3) improvement of reliable standby power at base station locations; 4) improvement of base stations to provide for two frequency operation (primary 47.04 MHz, secondary 47.16 MHz.

Additional recommendations are to provide long duration emergency power for the following base stations and integraie their control to Civil Defense district and county EOC's: Miles City base-Miles City control, Belt Butte base-Great Falls control, Missoula base-Missoula control, Red Lodge base-Billings control, Saco base-Fort Peck relay-Wolf Point control, Dillon base-Butte control, Big Mountain base-Kalispell control and Mocassin Mountain base-Lewistown control.

INTRODUCTION

Two-way radio communication and an operational interface to law enforcement agencies have proven to be effective aids to the operation of Montana's correctional institutions.

SYSTEM DESCRIPTION

Montana State Prison in Deer Lodge is the State's adult correctional institution. Reliable and rapid communication with law enforcement agencies has become an integral segment in the overall operation of this institution. The Prison maintains two-way communications on the Statewide frequency, 39.82 MHz and on the Prison's assigned frequency of 39.68 MHz. One base station, nine mobile and four portable units are operated by the Prison. A communication control center has been established for use by Prison officials and the Registrar of Motor Vehicles. Deer Lodge Sheriff also has access to the Prison base station through a remote control console.

Pine Hills School, located in Miles City, is the State's correctional institution for boys 10-21 years of age. At present, Pine Hills is operating with six mobile radios on the Statewide law enforcement frequency, 39.82 MHz. Since Pine Hills is an open institution, close coordination with other law enforcement agencies has proven essential in the prevention and rapid apprehension of runaways.

Mountain View School, located near Helena, is the State's correctional institution for girls 10-21 years of age. Mountain View is also an open institution, and like Pine Hills, runaways are somewhat frequent. In the past, the School has been operating with out-of-date citizen's band radio equipment. Plans are now underway to update radio communications. The new equipment will consist of one base station, six mobile and three portable units operating on a frequency of 155.925 MHz.

Members of the Board of Pardons and several Probation Officers have been equipped with two-way mobile communication. To date, the Probation and Parole Division has installed fifteen mobile units in officer's vehicles.

For an inventory of radio equipment maintained by the Department of Institutions see Appendix II.

PLANS & RECOMMENDATIONS

Communications systems at these institutions have gradually been updated over the past few years.

Future plans include replacement of the few remaining outdated pieces of equipment as funds are available.

AERONAUTICS DIVISION

INTRODUCTION

Reliable air to ground radio communication and electronic navigational information have become vital to our rapidly increasing air transport services. The Aeronautics Division maintains one directional and two-way radio communications systems to provide aircraft with the information necessary for safe operation.

SYSTEM DESCRIPTION

The radio communications systems operated by the Division consist of non-directional radio beacon transmitters (H-Markers) and aeronautical advisory stations (UNICOMS) located throughout Montana.

The H-Marker system provides aircraft within range with navigation and/or landing information. Presently, thirteen (13) H-Marker stations are located on or near municipal airports. H-Marker stations operate in the 200-410 KHz frequency range, and are licensed for unattended 24 hour operation.

The UNICOM Network consists of fifty two (52) transceivers located on or near municipal airports. These ten watt units provide two-way air to ground communications concerning existing weather conditions, other aircraft in the vicinity, landing instructions, etc. UNICOM stations operate on one or more of the assigned frequencies: 121.50 MHz, 122.80 MHz, 123.00 Mhz and 123.05 MHz.

PLANS AND RECOMMENDATIONS

The H-Marker and UNICOM systems have expanded steadily over the past fifteen years. Future plans include continued expansion, to provide adequate navigational information throughout the entire State and UNICOM stations at all public use airports in Montana.

OFFICE OF HIGHWAY TRAFFIC SAFETY - EMERGENCY MEDICAL SERVICES

INTRODUCTION

Direct communication between ambulance personnel in the field and the hospital emergency room is one of the primary links in the Emergency Medical Services program. Radio communications play the important role of providing this rapid interchange of vital information.

Through the Office of Highway Traffic Safety, federal funds are being administered for the development and installation of improved Emergency Medical Services communications systems in communities throughout Montana.

SYSTEM DESCRIPTION

The Emergency Medical Services (EMS) radio communications systems in operation in Montana consist basically of selective calling from an ambulance to a nearby hospital or medical facility and interhospital communication during emergency situations.

A Statewide ambulance-to-hospital frequency has been assigned as 155.280 MHz. A secondary frequency, 155.340 MHz, has been allocated for hospital-to-hospital communication and hospital administrative use. Eleven other Special Emergency Radio Service (SER) frequencies are available for assignment to individual hospitals and ambulance services.

A basic EMS radio communication system is shown in figure 2-3. Using the digital encoder, the ambulance personnel may alert which ever hospital is desired; the other hospital is not disturbed. The alerted hospital responds via standard squelch and a continuous communication link is established between hospital and ambulance. When the need arises, inter-hospital communication is available over the secondary frequency. In the larger urban areas, a more complex system may be justified. Another frequency in the SER band may be assigned for ambulance dispatching or intra-hospital use.

Figure 2-3 represents a minimal EMS communications system. A wide variety of optional equipment is available to satisfy the individual communication requirements of a hospital or an ambulance service.

Locations of the ambulance services in Montana and their classes of communications capabilities are shown in figure 2-4. Class I capability is a basic EMS communication system as shown in figure 2-3. In some areas, however, ambulance services are located in communities without hospital facilities. An ambulance service with Class I capability in these communities is in direct radio contact with the nearest hospital to which patients are carried.

Information concerning EMS communications equipment and systems is available from the Communications Bureau.

PLANS AND RECOMMENDATIONS

A comprehensive EMS plan is being developed by the Department of Health for publication in July 1973. A detailed Statewide EMS communications plan will be included as a chapter in the master plan. The Department of Health, Office of Highway Traffic Safety, and the Communications Bureau are working jointly to develop local and Statewide communication systems for Emergency Medical Services.

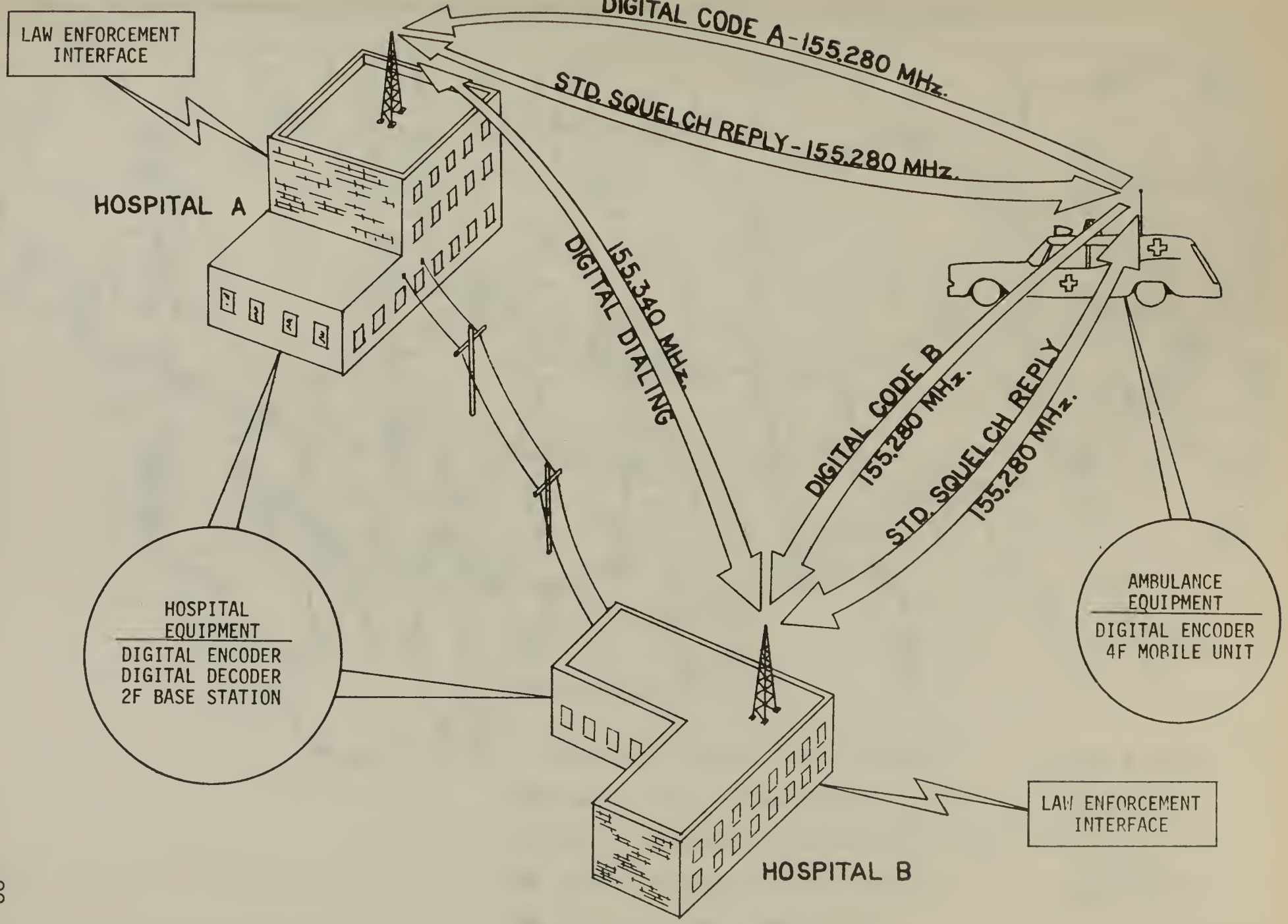
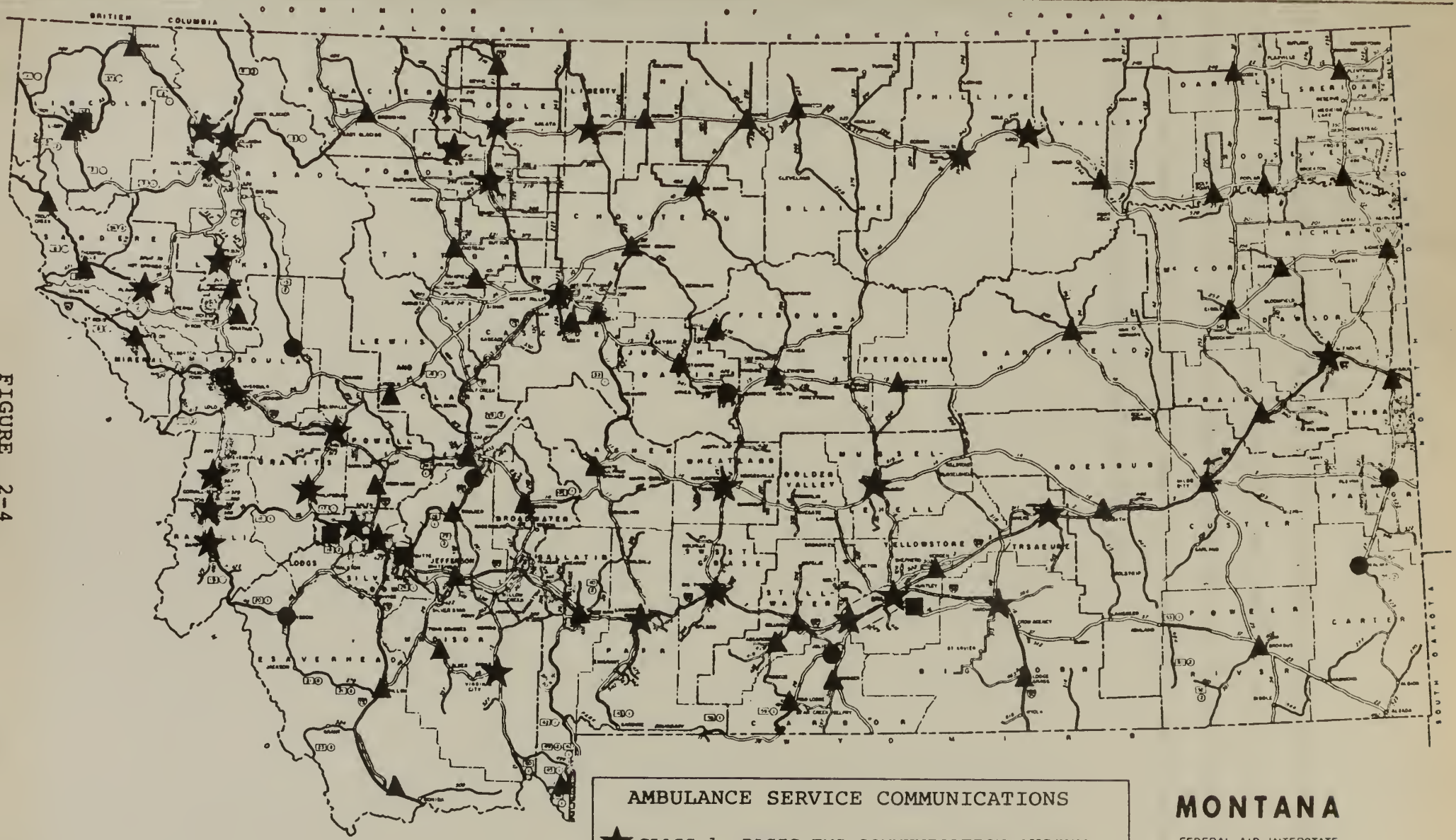


FIGURE 2-3

BASIC EMS COMMUNICATION SYSTEM



AMBULANCE SERVICE COMMUNICATIONS

- ★ CLASS 1 - BASIC EMS COMMUNICATION SYSTEM
- ▲ CLASS 2 - AMBULANCE TO LAW ENFORCEMENT ONLY
- ■ CLASS 3 - AMBULANCE TO DISPATCHER ONLY
- ● CLASS 4 - NO RADIO COMMUNICATION

MONTANA

FEDERAL AID INTERSTATE,
FEDERAL AID PRIMARY,
FEDERAL AID SECONDARY
AND FOREST HIGHWAY ROUTES

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
PLANNING AND RESEARCH BUREAU
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

COMMUNICATIONS BUREAU
MARCH 1, 1973

FIGURE 2-4

Included in the Communications section will be equipment and system guidelines, frequency assignments, criteria for obtaining equipment, provisions for interfacing communities and services not in operation on the EMS system, and operational procedures. Recommendations will also be made as to interagency coordination and a close relationship to Montana's Civil Defense plan.

MONTANA HIGHWAY PATROL

INTRODUCTION

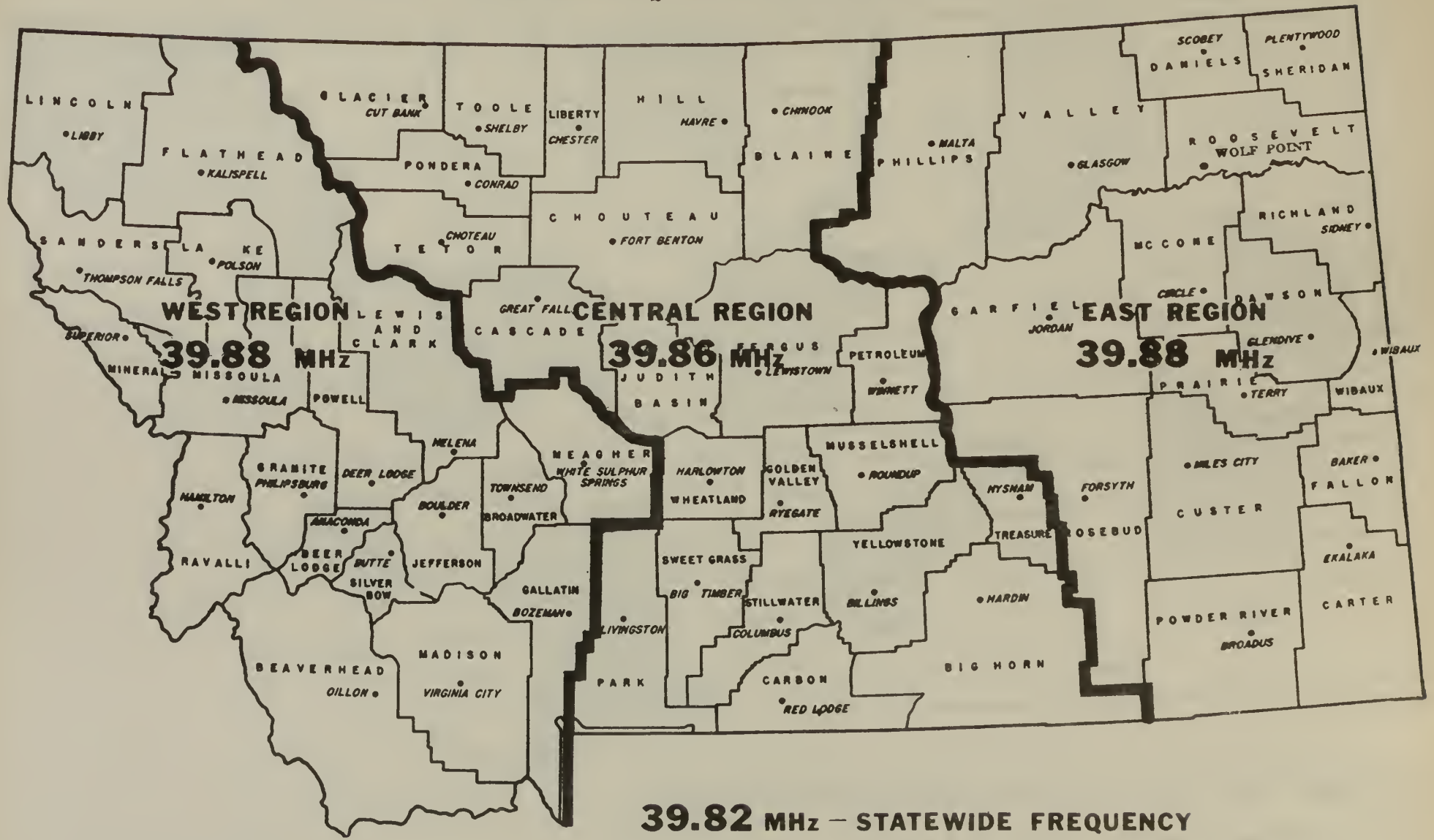
Over five billion miles were driven on Montana's highway system in 1972 and this figure is expected to increase in the coming years. The Montana Highway Patrol has the immense responsibility to ensure maximum safety to all users of our roads and highways by enforcing Montana's highway traffic laws.

Radio communications have become essential to the patrolman in the field. Without his mobile radio or without adequate radio coverage, a law enforcement officer is severely hampered and often endangered.

SYSTEM DESCRIPTION

In February of 1971 a comprehensive plan for law enforcement radio communications was put into effect in Montana. This plan, developed by the Electronics Research Laboratory in Bozeman under a sponsoring grant from the Governor's Crime Control Commission (now the Montana Board of Crime Control), divides the State into three regions. Regional boundaries were determined primarily due to radio propagation limits and geographic considerations. A Statewide emergency frequency is maintained and each region is assigned one frequency plus several local frequencies to avoid congestion on the Statewide frequency. Individual agencies have been assigned their own frequencies for intra-agency base and mobile coordination. For example, the Montana Highway Patrol has been assigned 39.92 MHz as its operating frequency. Figures 2-5 and 2-6 give a graphical representation of the law enforcement communications plan.

MONTANA LAW ENFORCEMENT COMMUNICATIONS PLAN
REGIONAL FREQUENCY ASSIGNMENTS

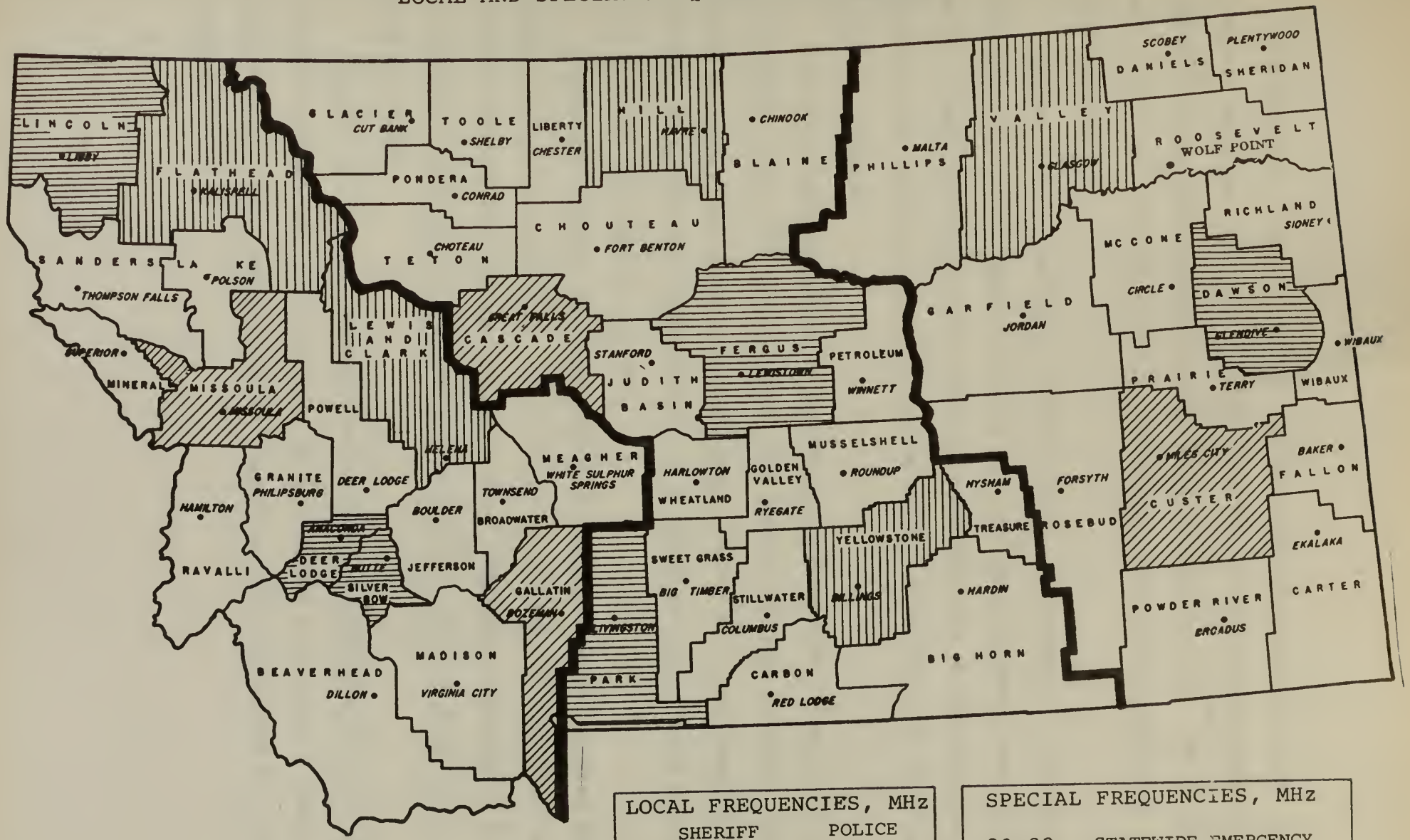


No. 1052 — County Outline Map
STATE PUBLISHING COMPANY
Helena

January, 1973

FIGURE 2-5

MONTANA LAW ENFORCEMENT COMMUNICATIONS PLAN
LOCAL AND SPECIAL FREQUENCY ASSIGNMENTS



LOCAL FREQUENCIES, MHz	SHERIFF	POLICE
▨	39.76	39.94
▨	39.84	39.72
▨	39.80	39.96

SPECIAL FREQUENCIES, MHz	
39.82	STATEWIDE EMERGENCY
39.92	MONT. HIGHWAY PATROL
39.90	DEPT. OF FISH & GAME
39.78	DEPT. OF LIVESTOCK
39.74	TRIBAL POLICE & BIA
39.98	C.D. AND LOCAL GOV'T.

FIGURE 2-6

January, 1973

The decision to remain low band (39 MHz range) for law enforcement communications was based upon the large existing inventory of low band equipment and the increased coverage areas obtainable with low band communications. The option to convert to high band (155 MHz range) is available to city police departments in the larger urban areas.

Agencies such as the Montana Highway Patrol, Department of Livestock, and the Department of Fish and Game, which rely on local law enforcement base stations for mobile dispatch and coordination, maintain communications on the Statewide frequency, 39.82 MHz, the regional frequencies, 39.86 MHz and 39.88 MHz; plus their own assigned frequency.

The Montana Highway Patrol is currently operating with 214 mobile units, seven (7) portable radios and six (6) Patrol base stations located in Helena, Butte, Missoula, Great Falls, Glendive and Billings. The Patrol's requirements for Statewide base to mobile communication can only be attained through close coordination with local law enforcement agencies.

Figure 2-7 indicates the base station locations of law enforcement agencies maintaining 24 hour operation on 39.82 MHz. The majority of these base stations are also equipped with the appropriate regional frequency. Communities not shown in figure 2-7 generally have communications capabilities, but normally on an 8 a.m. to 5 p.m. basis.

Figure 2-8 shows the communication coverage and problem areas on 39.82 MHz. All other frequencies in the low band law enforcement spectrum will demonstrate relatively the same coverage areas if transmitted from the present base station locations.

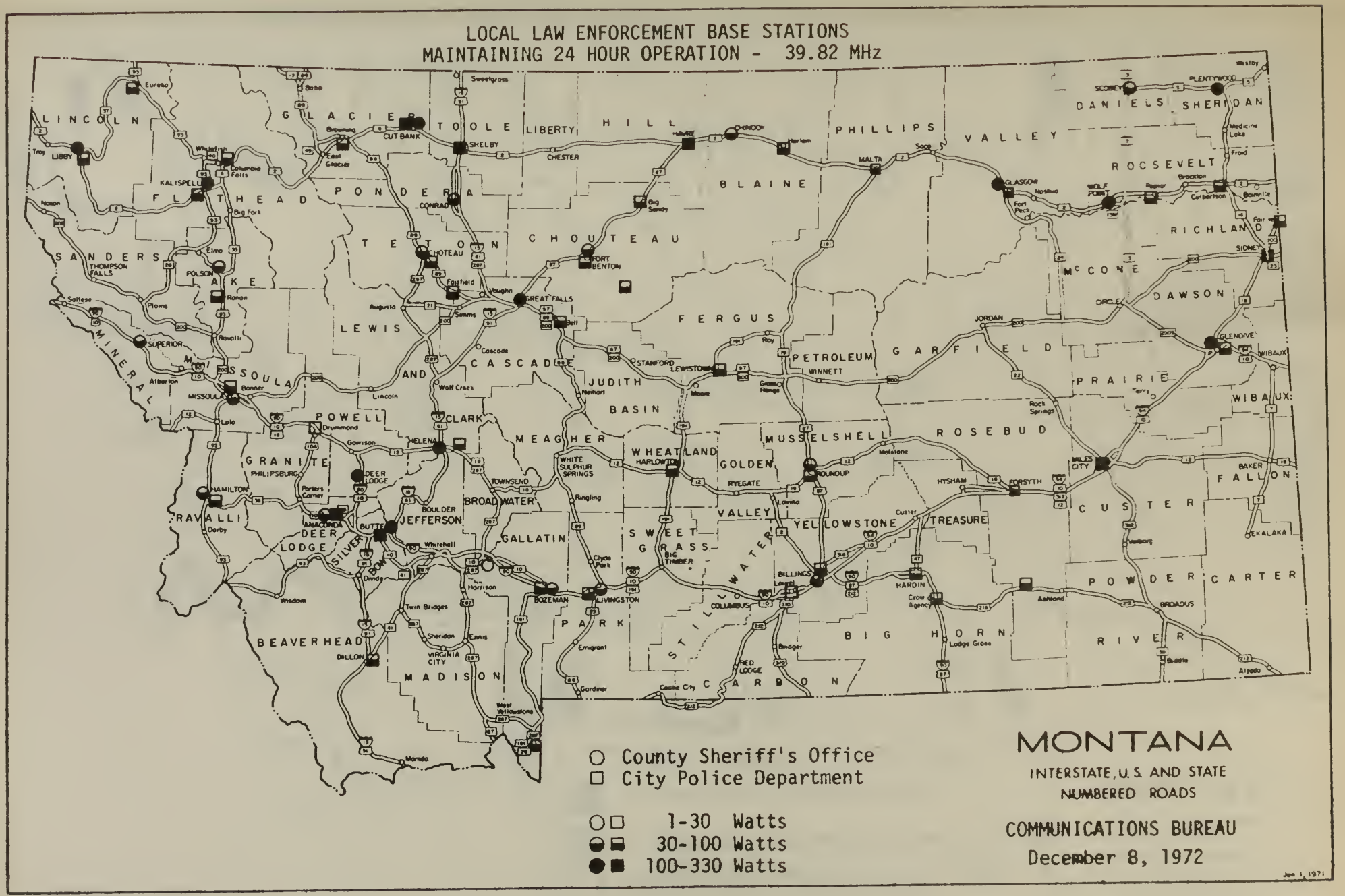

LOCAL LAW ENFORCEMENT BASE STATIONS
MAINTAINING 24 HOUR OPERATION - 39.82 MHz
LINCOLN
GLACIER
TOOLE
LIBERTY
HILL
PHILLIPS
VALLEY
DANIELS
SHERIDAN
ROOSEVELT
FLATHEAD
PONDERA
BLAINE
RICHLAND
TETON
CHOUTEAU
SANDERS
LAKE
MINERAL
LEWIS AND CLARK
CASCADE
FERGUS
McCONE
DAWSON
MISSOULA
POWELL
JUDITH BASIN
PETROLEUM
GARFIELD
PRAIRIE
WIBAUX
GRANITE
MEAGHER
WHEATLAND
MUSSELSHELL
ROSEBUD
RAVALLI
BROADWATER
GOLDEN VALLEY
CUSTER
FALLON
DEER LODGE
SILVER BOW
JEFFERSON
GALLATIN
SWEET GRASS
YELLOWSTONE
TREASURE
BEAVERHEAD
PARK
STILLWATER
POWDER RIVER
CARTER
BIG HORN
MADISON
CARBON
CUT BANK
SHELBY
CHESTER
HAVRE
MALTA
GLASGOW
WOLF POINT
PLENTYWOOD
SCOBEY
SIDNEY
CONRAD
FORT BENTON
GREAT FALLS
LEWISTOWN
JORDAN
GLENDIVE
WINNETT
ROUNDUP
MILES CITY
FORSYTH
HYSHAM
KALISPELL
POLSON
MISSOULA
HELENA
DEER LODGE
BUTTE
ANACONDA
HAMILTON
WHITEHALL
BOZEMAN
LIVINGSTON
BILLINGS
HARDIN
CROW AGENCY
BROADUS
DILLON
VIRGINIA CITY
TWIN BRIDGES
WHITE SULPHUR SPRINGS
HARLOWTON
RYEGATE
TOWNSEND
CLYDE PARK
BIG TIMBER
COLUMBUS
RED LODGE
CLARKS FORK
EKALAKA
BAKER
○ County Sheriff's Office
□ City Police Department
○□ 1-30 Watts
◒◨ 30-100 Watts
●■ 100-330 Watts
MONTANA
INTERSTATE, U.S. AND STATE NUMBERED ROADS
COMMUNICATIONS BUREAU
December 8, 1972

FIGURE 2-7

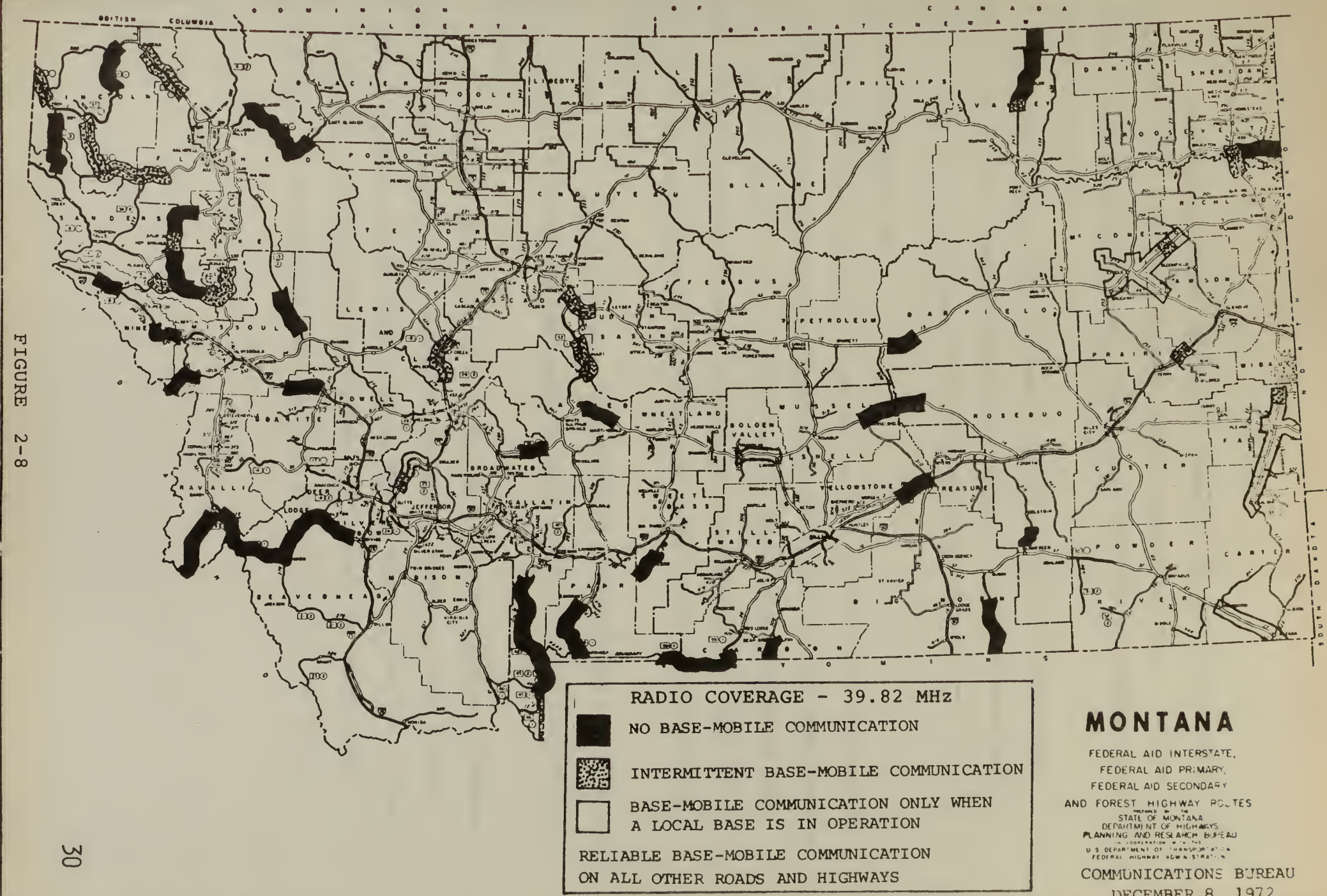

RADIO COVERAGE - 39.82 MHz
NO BASE-MOBILE COMMUNICATION
INTERMITTENT BASE-MOBILE COMMUNICATION
BASE-MOBILE COMMUNICATION ONLY WHEN A LOCAL BASE IS IN OPERATION
RELIABLE BASE-MOBILE COMMUNICATION ON ALL OTHER ROADS AND HIGHWAYS
MONTANA
FEDERAL AID INTERSTATE,
FEDERAL AID PRIMARY,
FEDERAL AID SECONDARY
AND FOREST HIGHWAY ROUTES
STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
PLANNING AND RESEARCH BUREAU
COMMUNICATIONS BUREAU
DECEMBER 8, 1972

FIGURE 2-8

The Montana Highway Patrol maintains a communications maintenance service in Helena consisting of one radio engineer and the necessary equipment. Communications equipment maintenance in the outlying areas is generally contracted to the Department of Highways.

A complete communications equipment inventory for local law enforcement agencies is available from the Communications Bureau. A complete communications inventory for the Montana Highway Patrol is given in Appendix II.

PLANS AND RECOMMENDATIONS

A plan for the installation of several remote repeater sites at selected locations to alleviate the major dead spots and problem areas in radio communications is in the final stages. The first installations should be in operation by late 1973. The repeaters will transmit 39.96 MHz and receive 39.56 MHz. Base and mobiles will use cross band techniques and tone coded squelch for access to the repeaters.

Provisions in the comprehensive law enforcement communications plan allow for the systematic expansion and improvement of radio communications as funds become available.

One additional recommendation is to provide for rapid relocation of Montana Highway Patrol base stations or base station remote controls to Civil Defense Emergency Operating Centers (EOC) in Helena, Butte, Missoula, Great Falls, Glendive, Billings and any future installations. If base station remote control is relocated to an EOC emergency power should be provided for the base station.

REGISTRAR OF MOTOR VEHICLES, MONTANA LAW ENFORCEMENT TELETYPE SYSTEM, FIRE MARSHALLS & CRIMINAL INVESTIGATORS

INTRODUCTION

Within the Department of Justice four additional Bureaus maintain two-way radio communications on law enforcement frequencies.

SYSTEM DESCRIPTION

The Registrar of Motor Vehicles, headquartered in Deer Lodge, operate one base station on the law enforcement frequencies. A communication control center has been established in the Registrar's office with a direct interface to the Prison's communication system, local law enforcement agencies and the Montana Law Enforcement Teletype System.

The Montana Law Enforcement Teletype System (MLETS) Bureau operates one remote control console to the Highway Patrol base located on Mac Donald Pass, plus three mobile radios installed in Departmental vehicles.

The Fire Marshall Bureau has equipped five officer's vehicles with two-way radio to interface to law enforcement agencies.

The Criminal Investigation Bureau has installed mobile radios in two vehicles and maintains two portable units to assist the Investigators in their work throughout the State.

See Appendix II for an inventory of radio equipment maintained by these Bureaus.

PLANS & RECOMMENDATIONS

Future plans by these agencies include the replacement of outdated units and continued expansion of facilities as funds permit.

BRANDS-ENFORCEMENT DIVISION

INTRODUCTION

At the present time there are over 55,000 registered brands in the State of Montana. Each year, more than two million cattle are inspected by the Department at the seventeen livestock facilities and various ranches and shipping points throughout the State.

The Department of Livestock maintains a two-way communication interface between its officers in the field and other law enforcement agencies to speed effective enforcement of all laws concerning livestock and related activities.

SYSTEM DESCRIPTION

The Brands-Enforcement Division has equipped seventeen vehicles with mobile radios for use by their field officers. One base station has been installed in Billings for dispatching of the Division's officers in the surrounding area. Four portable units are also assigned to the officers for field use.

The Brands-Enforcement Division relies almost entirely on county and local law enforcement communication systems. Coordination and dispatching of Livestock personnel from other law enforcement agencies are accomplished over the Statewide frequency, 39.82 MHz. Division activities and mobile-to-mobile communications are carried over the assigned Livestock frequency, 39.78 MHz.

For a description of the county and local communications systems see "Radio Communications-Montana Highway Patrol."

The Division has no radio maintenance facilities. Generally, maintenance is contracted to the Communications Bureau of the Department of Highways.

A complete inventory of radio equipment for the Department of Livestock is given in Appendix II.

PLANS AND RECOMMENDATIONS

Future plans by the Brands Enforcement Division include provisions to equip all commissioned officers with mobile radios as funds permit. Also under consideration are the relocation of the existing base station in Billings and the purchase of one additional base for use in the Great Falls, Helena or Sidney areas.

CIVIL DEFENSE

INTRODUCTION

Rapid coordination of available resources and manpower is vital to the efficient handling of emergency situations. Two-way radio often becomes the only means of communication between disaster stricken areas and available help.

SYSTEM DESCRIPTION

The Civil Defense Division does not have requirements for day to day radio communications but during emergency or disaster situations Civil Defense does have authority to command the use of other State agencies' communications equipment.

Systems in operation at the State Civil Defense Headquarters in Helena are the National Guard State Emergency Net, Civil Defense National Radio System (CDNARS II), Radio Amateurs Civil Emergency Service (RACES), Civil Air Patrol (CAP), and remote systems to Radio Station KCAP (Emergency Broadcast System - EBS), Department of Highways and Montana Highway Patrol.

The National Guard State Emergency Net operates on a primary frequency of 49.60 MHz, with secondary frequencies of 40.35 MHz, 80.40 MHz, 80.60 MHz and 81.70 MHz. Presently four (4) base stations and two (2) mobile units are in operation. Additional equipment is available from the National Guard during emergency situations.

The CDNARS II system operates on assigned frequencies of 73.48 MHz, 47.80 MHz and 104.93 MHz. One CDNARS base station is located at the State Civil Defense Headquarters.

RACES is an organization of radio amateurs who volunteer their services and equipment to provide a Statewide net in emergency conditions. Both FM and single sideband equipment are used. The FM system operates in the two-meter band on frequencies of 146.76 MHz, 146.82 MHz, 146.88 MHz and 146.94 MHz. Single sideband voice transmission is carried on the primary frequency 3996.5 KHz, with secondary frequencies 1991.0 KHz and 7248.5 KHz. Single sideband telegraph transmission is carried on frequencies of 1999.0 KHz, 3533.5 KHz, 7100.5 KHz and 7114.0 KHz. One RACES base station is located at State Civil Defense Headquarters.

The CAP system operates on frequencies 46.01 MHz and 46.04 MHz with a CAP base located at Civil Defense Headquarters.

Remote control of Radio Station KCAP is carried over an assigned frequency of 161.70 MHz for the Emergency Broadcast System. A transmitter is located at Civil Defense Headquarters with the receiver and interface equipment at KCAP.

Remote control base stations and consoles are also provided to access the Montana Highway Patrol's and Department of Highway's installations on Mac Donald Pass near Helena.

Information concerning Civil Defense radio communications equipment is available from the Communications Bureau.

PLANS AND RECOMMENDATIONS

Detailed plans and surveys of Civil Defense communications requirements have been published by the Division. Information concerning Civil Defense plans is available from the Communications Bureau or State Civil Defense Headquarters.

DIVISION OF FORESTRY

INTRODUCTION

An almost constant vigil is required to protect our abundant resources and preserve the natural wonders we find in Montana. Radio communications play an important part in this endeavor.

The Division of Forestry maintains a two-way radio network to coordinate fire prevention and suppression, forest land management and protection, administrative activities of the Division and to assist in cooperation with search and rescue organizations and Civil Defense.

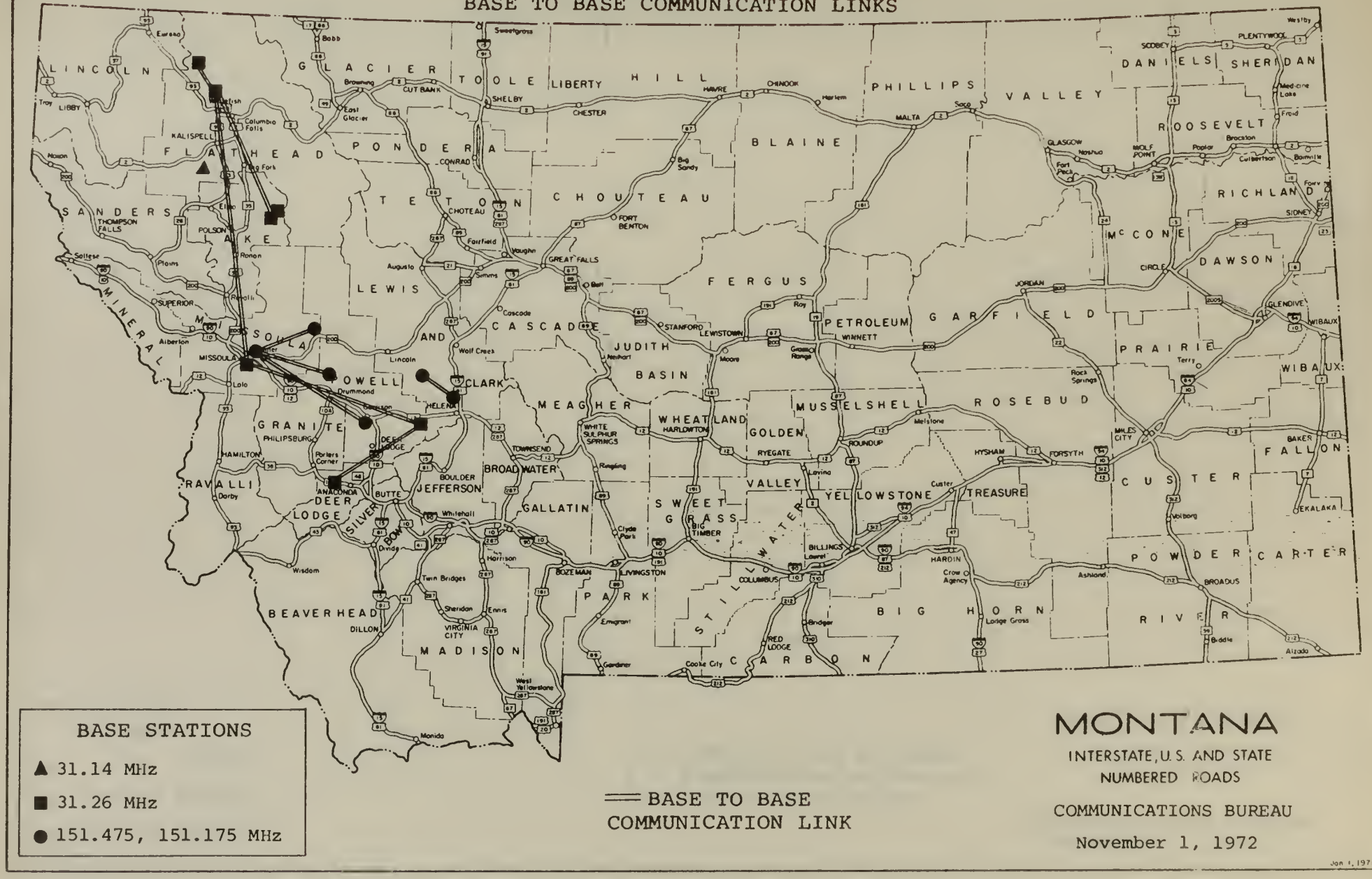
SYSTEM DESCRIPTION

At present, the Division is operating on both low band (31 MHz range) and high band (151 MHz range) frequencies, with an eventual conversion to all high band equipment. Because of a relatively large existing inventory of low band equipment, and in order to maximize the useful life of this equipment, the Northwest portion of the State has remained low band. The Southwest and Central sections have been converted to high band operation.

The low band network, headquartered in Kalispell, consists of eight base stations, located to provide maximum coverage. Remote locations are controlled by high band radio control links (See figures 2-10 and 2-11). Thirty-eight (38) mobile units and thirty (30) portable units are dispatched from these base stations for field activity.

DIVISION OF FORESTRY

BASE TO BASE COMMUNICATION LINKS



BASE STATIONS

▲ 31.14 MHz

■ 31.26 MHz

● 151.475, 151.175 MHz

═══ BASE TO BASE COMMUNICATION LINK

MONTANA

INTERSTATE, U.S. AND STATE NUMBERED ROADS

COMMUNICATIONS BUREAU

November 1, 1972

Jan 1, 1971

FIGURE 2-9

FORESTRY DIVISION
RADIO COMMUNICATION COVERAGE - 31.14 MHz

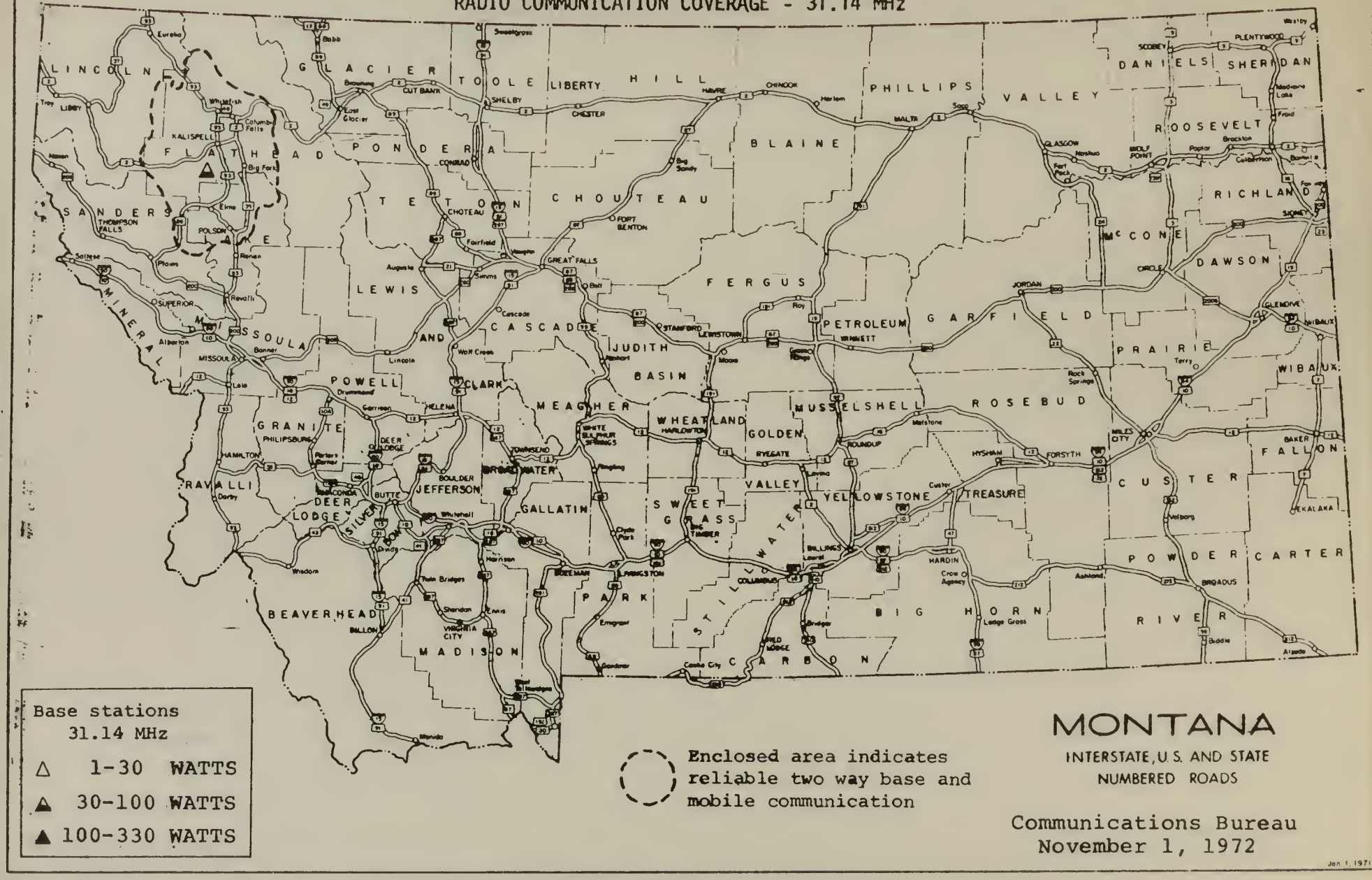


FIGURE 2-10

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

FORESTRY DIVISION

RADIO COMMUNICATION COVERAGE - 31.26 MHz

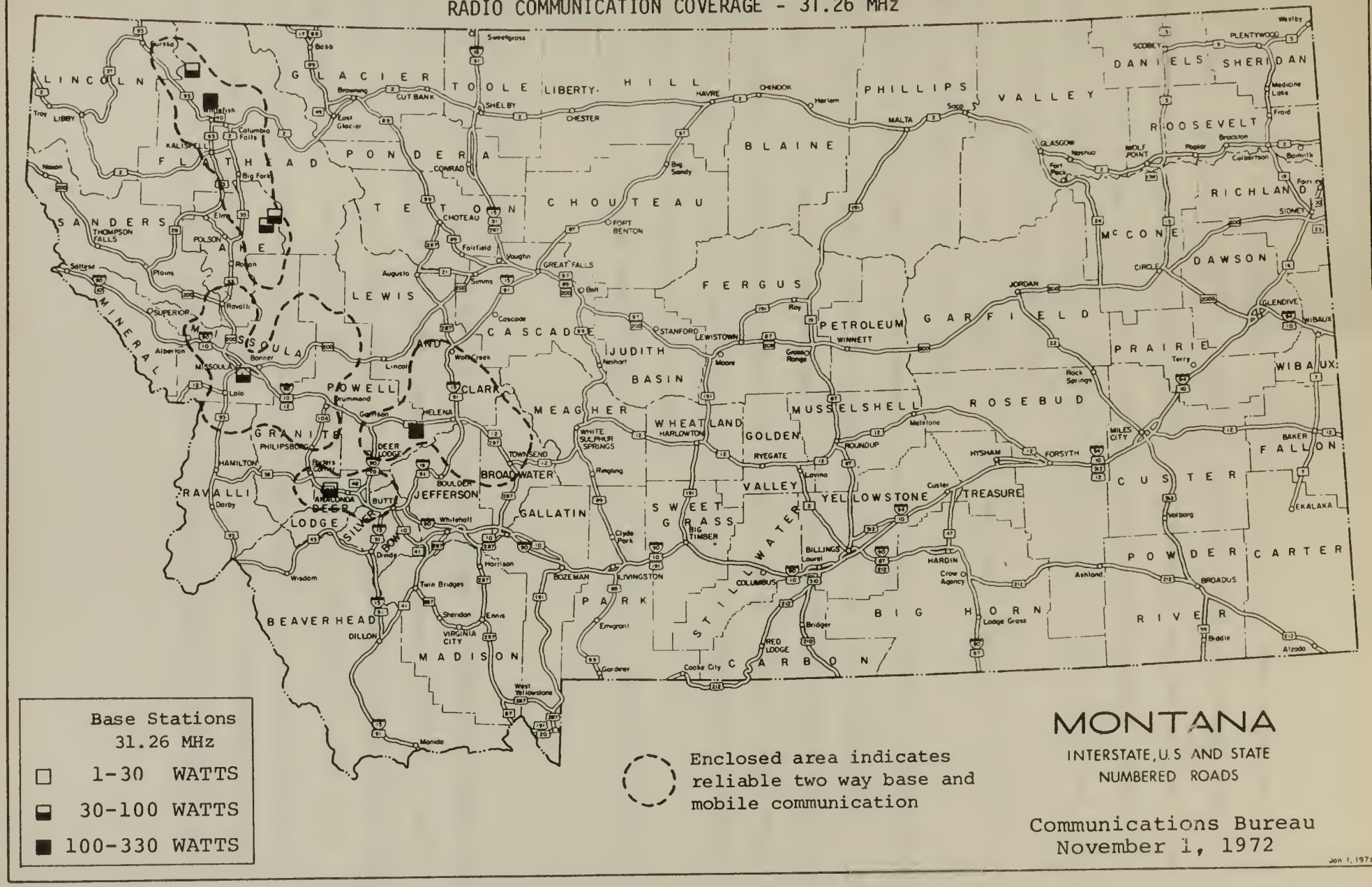


FIGURE 2-11

The high-band system presently consists of six base stations, twenty-six (26) mobile units and thirty-six (36) portables. The Union Peak and Belmont Peak installations function as a mobile or base controlled repeater to provide extended communications coverage (See figure 2-12). Duplex operation (simultaneous transmit and receive) is achieved by utilizing the repeater frequencies (151.475 MHz and 151.175 MHz) in mobile and base installations.

The high-band system is interfaced to the low band frequency, 31.26 MHz, in Helena and Missoula (See figure 2-9).

Normally the Foresters radio network operates during government working hours, but is manned for 24 hour operation during forest fires or other emergencies. The Division also operates its own maintenance facility in Missoula consisting of one radio engineer, limited shop equipment and a mobile van for on-sight field repair. At present the Division of Forestry has no operating interfaces to Civil Defense Emergency Operating Centers (EOC) in Montana.

A complete radio equipment inventory for the Division of Forestry is given in Appendix II.

PLANS AND RECOMMENDATIONS

In February of 1970, the Division of Forestry began implementing a second ten year plan for improvement of radio communication. At present, the plan is well underway, as two of the primary areas (Central and Southwest) have been furnished with a modern high band system. Included in the plan are provisions for up to eight tone-coded repeater installations (151 MHz range), an air to ground network, and systematic replacement of mobile and portable units. The Northwest section will remain low-band until the new high-band system is installed and operating.

FORESTRY DIVISION
RADIO COMMUNICATION COVERAGE - 151.475 AND 151.175 MHz

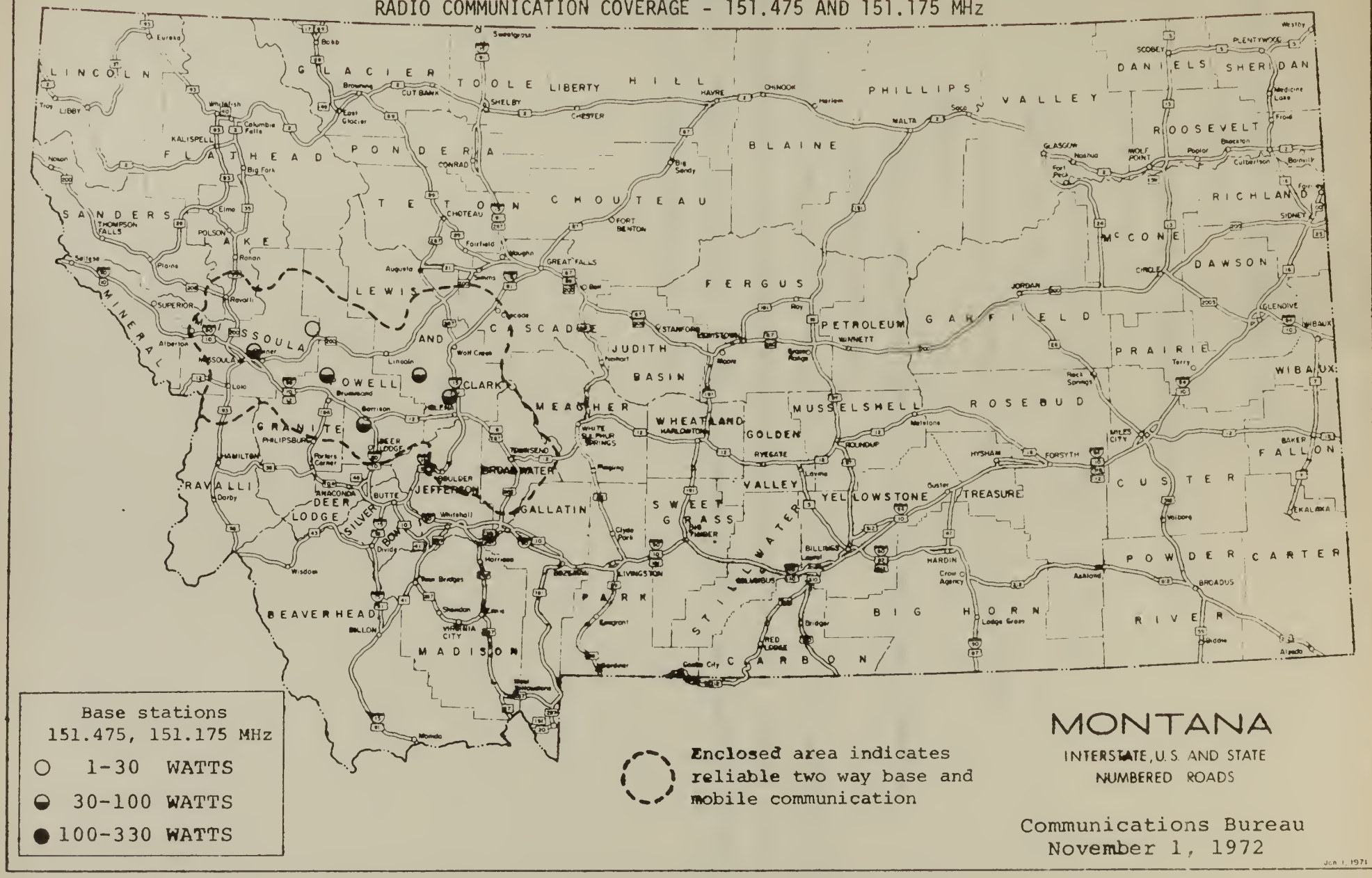


FIGURE 2-12

Below is a summary of the ten year plan:

Fiscal 1973

Conversion of Anaconda area to high band.

Fiscal 1974-1975

Augmentation of existing portions of the system.

Fiscal 1976-1977

Conversion of Northwest area to high band operation.

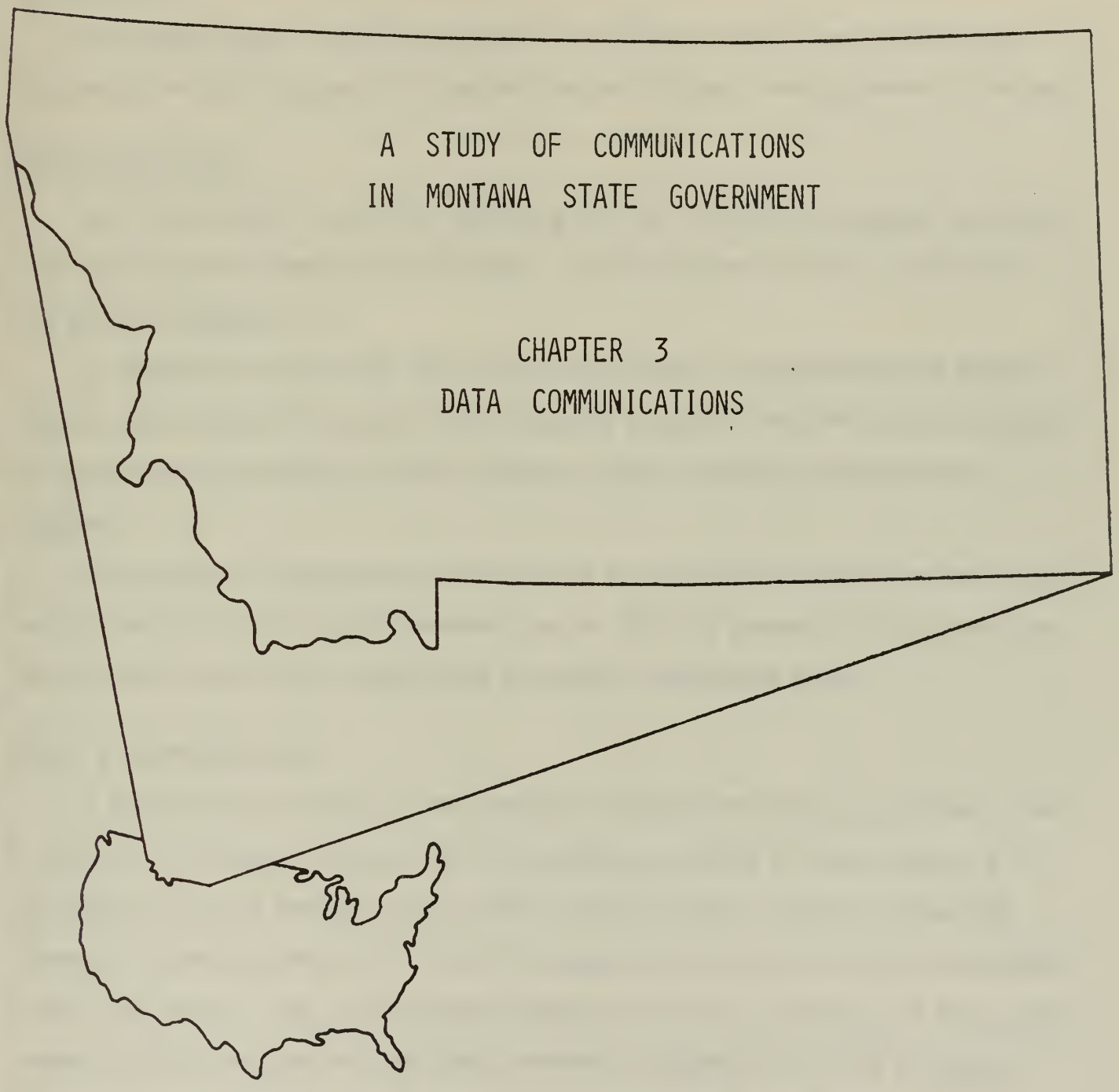
Completion

Total conversion of operation to high band, begin updating older high band units.

Recommendations for inclusion in the ten year plan are: (1) to provide for rapid relocation of base station control to Civil Defense EOC's in major cities — Helena, Missoula and Kalispell. (2) to provide reliable long duration emergency power to key base station locations.

A STUDY OF COMMUNICATIONS IN MONTANA STATE GOVERNMENT

CHAPTER 3
DATA COMMUNICATIONS



DATA PROCESSING BUREAU

INTRODUCTION

The trend today, in data processing, is away from stand-alone computers and towards their consolidation into powerful central systems serving several agencies.

SYSTEM DESCRIPTION

Data Processing is currently operating with an IBM 370/135 computer equipped with an Integrated Communications Adapter. Specifications for this installation are given in Appendix III.

In addition to the normal workload of the Bureau, the Communications Adapter enables connection of the Legislative Council's eight (8) IBM 2741 remote terminals to access the store and edit ALTER (Automated Legal Text Entry and Retrieval) program.

The Workman's Compensation Division also has remote data access and entry capability with two (2) IBM 2260 terminals and an IBM 1052 printer utilizing the Communications Adapter and an additional dedicated input/output port.

PLANS & RECOMMENDATIONS

A continuing evaluation of the computer facility and services provided is carried on by the Bureau. Because of the tremendous increase in State agencie's requirements for data processing and remote terminal access, the Data Processing Bureau is examining the possibilities for expansion of its facilities to accomodate remote job entries from the Employment Security Division, Department of Social and Rehabilitation Services and additional terminals located within Data Processing. A six month completion period is expected for the proposed expansion.

UNIVERSITY SYSTEM

INTRODUCTION

The computer has become a powerful tool to higher education; and following the general trends of today, smaller units of the University System are beginning to realize the benefits of utilizing telecommunications to access the larger computer facilities at Montana State University (MSU) and the University of Montana (UofM).

SYSTEM DESCRIPTION

Institutions within the University System primarily operate their computer installations independently for on-campus acedemic and administrative purposes. However, the computers at MSU and U of M do have the capabilities for remote job entry utilizing data switchers. Several of the smaller colleges have installed remote terminals for access to these facilities via a dedicated data link or a dial-up service using modems and multiplexors.

The heart of MSU's installation is an XDS Sigma 7 large scale computer configuration. A leased PBX data switcher is interfaced to 24, 110 baud ports with expansion limited to a maximum of 128 ports. Remote terminals dial-access the PBX which automatically connects the terminal to a free port on the computer. The Sigma 7 is also equipped with four additional dedicated ports for remote entry. Communication ports on the Sigma have capabilities for 110, 150, 300 and 1200 baud transmission rates.

MSU's Computer Systems Laboratory operates three Hewlett-Packard minicomputers for data acquisition, real time processing and operating systems development.

U of M's facility is centered around a DEC PDP-10 computer equipped with 24 data transmission ports. Sixteen of the ports are dedicated while the remaining eight are accessible through an isolated PBX data switcher. The system is expandable to a maximum of 127 ports with varying transmission rates. U of M also operates a DEC PDP-11/20 minicomputer for on campus use.

Other units with computer capabilities are: Eastern Montana College with an IBM 360/20, Northern Montana College with a Hewlett-Packard 2114 and an IBM tabulating system, and Montana College of Mineral Science and Technology with an IBM 1620.

Specifications for all the above installations are presented in Appendix III.

PLANS & RECOMMENDATIONS

A committee has been formed, under the Executive Office of the University System, to develop a comprehensive plan for computer and data communication requirements of higher education. A target date of October, 1973 has been set for the completion of this plan.

COMMUNICATIONS BUREAU

INTRODUCTION

The teletype system operated by the Department of Highways serves to provide hard-copy communications between the Helena Headquarters and Division offices; carrying road condition reports, weather data and administrative messages. The system also serves to interconnect the Department with press services and the Weather Bureau.

SYSTEM DESCRIPTION

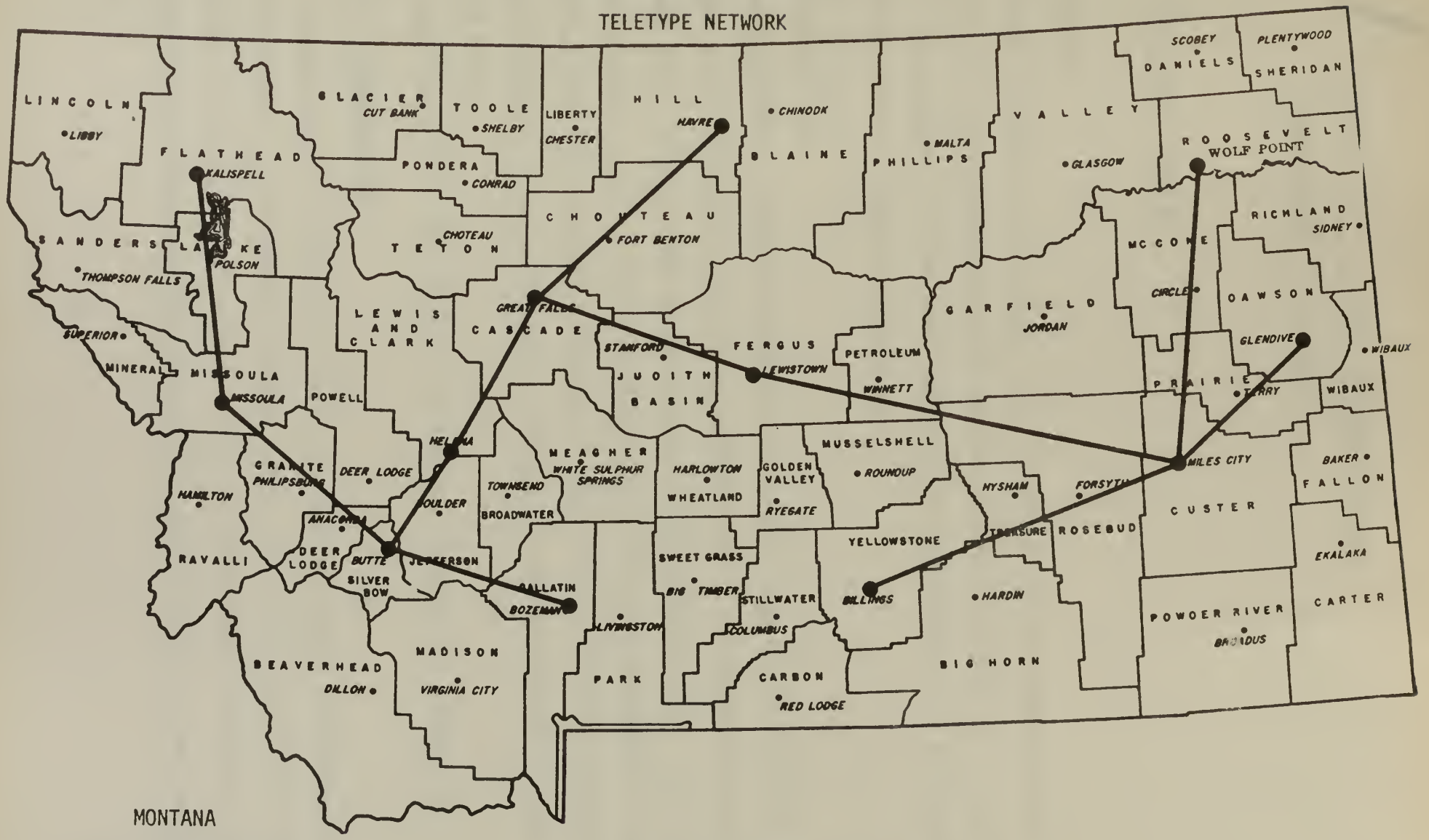
The Department leases sixteen (16) teletypes, models KSR 28 and ASR 28, from Mountain Bell. The interconnecting dedicated data lines are leased from General Services Administration. Twelve (12) teletypes in outlying offices are connected to the four (4) teletypes in Helena (See figure 3-1). Each teletype on the system can address any other teletype, with the Helena headquarters retaining all-points message transmit capability.

PLANS & RECOMMENDATIONS

The teletype system has been under study and the results indicate that the system is meeting the needs of the Department at a minimum cost. Until the system approaches maximum utilization, or until additional functions are required, no changes in the teletype system are planned.

DEPARTMENT OF HIGHWAYS

TELETYPE NETWORK



MONTANA

No. 1052 — County Outline Map

STATE PUBLISHING COMPANY
Helena

● Teletype Locations

Communications Bureau
November 1, 1972

DATA PROCESSING BUREAU

INTRODUCTION

Within the Department of Highways and other State agencies, the requirements for data access, data entry and remote problem solving are growing at an increasing rate. The Department provides State agencies with the capability to interactively communicate with its computer installation.

SYSTEM DESCRIPTION

The Department's computer installation is an IBM 360/40 equipped with ten (10) 150 baud ports for remote data entry and transmission. This computer is also equipped with a feature known as Interactive Terminal Facility (ITF). The ITF service is primarily used for remote problem solving, but can be expanded for remote data access and entry, or data collection of payroll and accounting information. Presently seven (7) IBM 2741 terminals in Helena are connected to the computer for the ITF service.

Specifications for this computer installation are given in Appendix III.

PLANS & RECOMMENDATIONS

The Department of Highways is planning to install a remote interactive problem solving terminal in the Missoula Division office. This installation will be the prototype for future remote terminals. Plans are also being formulated by the Department to expand the computer capabilities and ITF service as requirements increase.

The Department of Highways in conjunction with the Department of Intergovernmental Relations and the Department of Justice, has developed a preliminary traffic data base. A task force has been formed to investigate the expansion of the traffic records data base to include motor vehicle registration, driver licensing, criminal case history information and the interrelationships to the Montana Law Enforcement Teletype System.

MONTANA LAW ENFORCEMENT TELETYPE SYSTEM

INTRODUCTION

The Montana Law Enforcement Teletype System (MLETS) is the backbone of data communications among law enforcement agencies in the State. Montana lawmen have made more than 600 "hits" (location of fugitives or stolen goods) attributed to the System since operation began in 1969.

SYSTEM DESCRIPTION

Currently MLETS is undergoing a total revision in system design. Full operation of the new system is scheduled for June 1, 1973.

Within the new system, an Action Communications Systems Telecontroller will function as the central communications processor, storing and switching messages from the 45 terminals located throughout the State. (See figure 3-2). The Action Telecontroller will provide fully automated operation and enable automatic polling of remote terminals, direct intrastate message switching, automatic message store and forward capability and direct connection to the National Law Enforcement Teletype System (NLETS) and the National Crime Information Center (NCIC), Washington, D. C.

The remote terminals are connected over dedicated leased lines to the Action Telecontroller located in the MLETS center at Helena. Teletype Corporation model ASR 33 and 35 teletypes are used throughout the State.

Specifications for the Action Telecontroller are listed in Appendix III.

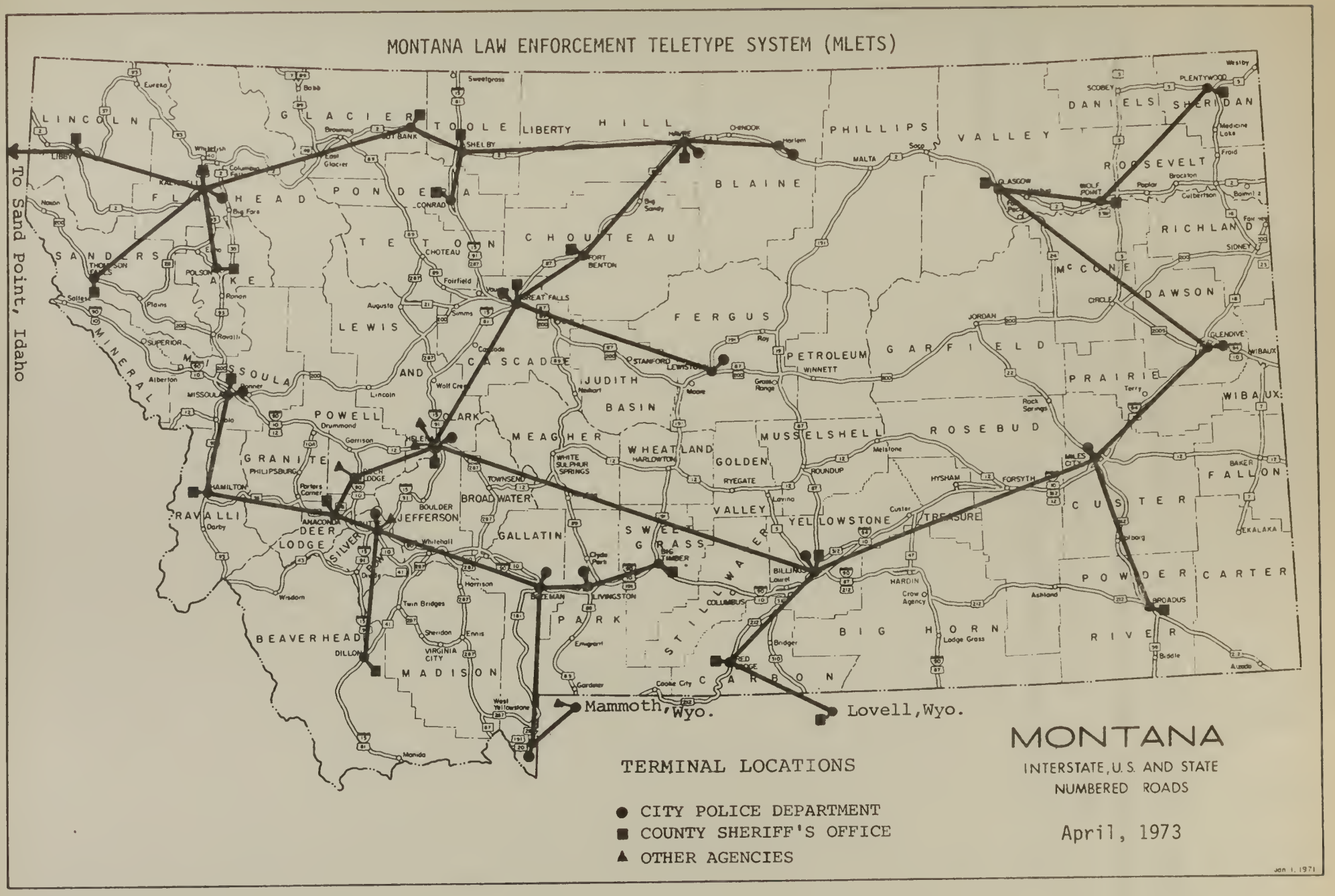
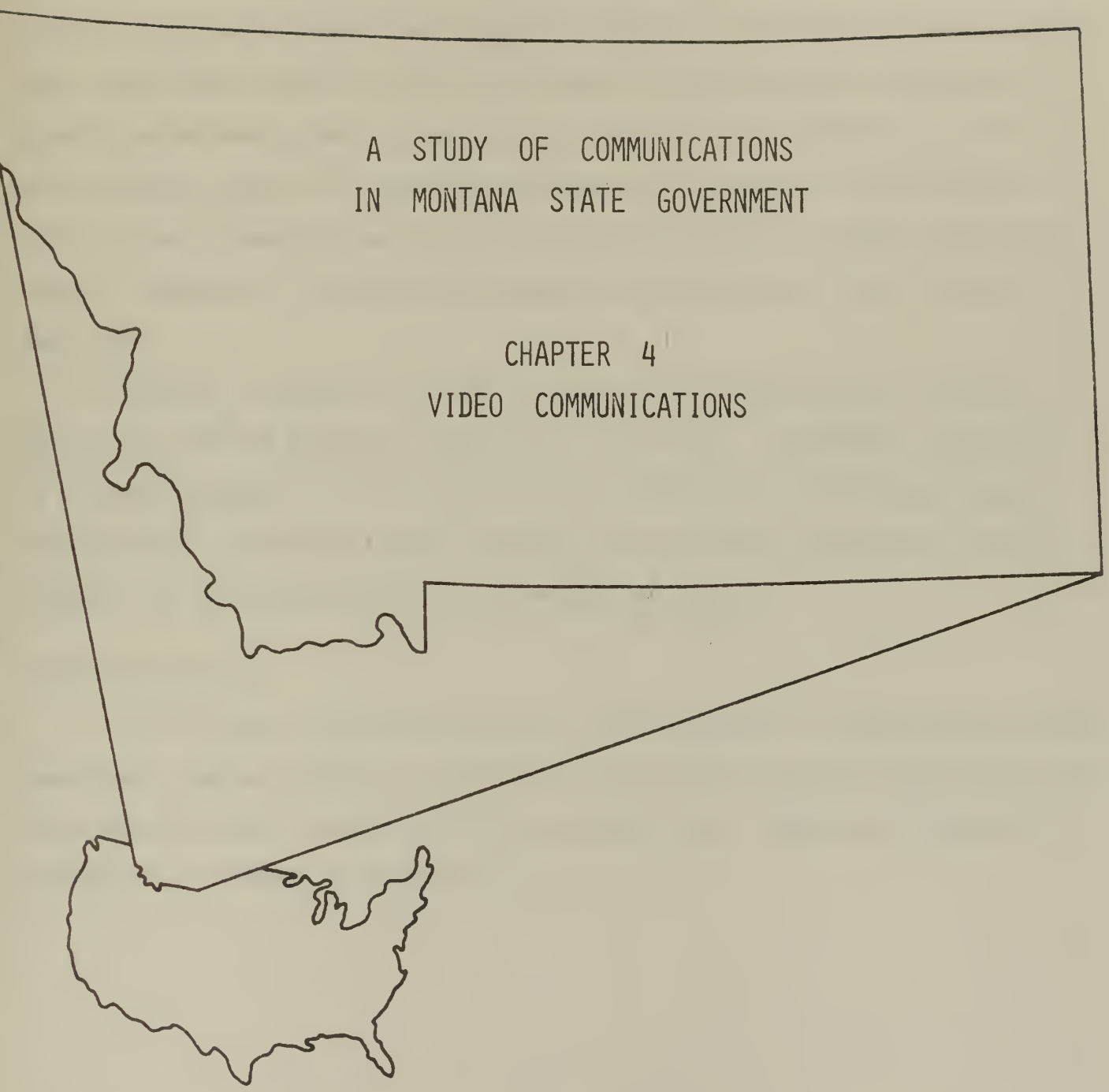

MONTANA LAW ENFORCEMENT TELETYPE SYSTEM (MLETS)
To Sand Point, Idaho
Mammoth, Wyo.
Lovell, Wyo.
TERMINAL LOCATIONS
● CITY POLICE DEPARTMENT
■ COUNTY SHERIFF'S OFFICE
▲ OTHER AGENCIES
MONTANA
INTERSTATE, U.S. AND STATE NUMBERED ROADS
April, 1973
LINCOLN
GLACIER
TOOLE
LIBERTY
HILL
PHILLIPS
VALLEY
DANIELS
SHERIDAN
ROOSEVELT
RICHLAND
DAWSON
McCONE
GARFIELD
PRAIRIE
WIBAUX
FALLON
CUSTER
POWDER RIVER
CARTER
BIG HORN
CARBON
STILLWATER
YELLOWSTONE
TREASURE
ROSEBUD
MUSSELSHELL
GOLDEN VALLEY
WHEATLAND
MEAGHER
BROADWATER
GALLATIN
PARK
SWEET GRASS
JEFFERSON
BOULDER
LEWIS AND CLARK
CASCADE
JUDITH BASIN
FERGUS
PETROLEUM
BLAINE
CHOUTEAU
HILL
FLATHEAD
LAKE
SANDERS
MINERAL
MISSOULA
POWELL
GRANITE
RAVALLI
DEER LODGE
SILVER BOW
BEAVERHEAD
MADISON
TETON
PONDERA
CONRAD
SHELBY
GREAT FALLS
HELENA
BUTTE
MISSOULA
KALISPELL
LIBBY
HAVRE
MALTA
GLASGOW
WOLF POINT
SIDNEY
GLENDIVE
MILES CITY
BILLINGS
LIVINGSTON
BOZEMAN
DILLON
BROADUS
JAN 1, 1971

FIGURE 3-2

PLANS AND RECOMMENDATIONS

Extensive studies and plans have brought about this revision in MLETS. During the next three years the new System will be examined and evaluated. Recommendations will be made for planned expansion of the System's capabilities. Also under consideration is the development of a criminal case history data base utilizing the new Telecontroller.



A STUDY OF COMMUNICATIONS IN MONTANA STATE GOVERNMENT

CHAPTER 4
VIDEO COMMUNICATIONS

EDUCATIONAL TECHNOLOGY DEMONSTRATION

INTRODUCTION

In April of 1974, a Titan III-C launch vehicle will lift off from Cape Kennedy carrying a Fairchild Applications Technology Satellite (ATS-F) into a geosynchronous orbit some 20,000 miles above the earth. With this launching, one of the most innovative educational communications projects of our time will begin serving the Rocky Mountain region. The project is the Educational Technology Demonstration (ETD). It will have the capability of reaching populations and remote areas previously inaccessible to conventional educational television and radio broadcast facilities.

The project is being directed by the Federation of Rocky Mountain States in association with the Education Commissions of the States. In Montana, the Office of the Superintendent of Public Instruction is acting as the coordinating agency. Joining the six Federation members (Colorado, Idaho, Montana, New Mexico, Utah and Wyoming) are the neighboring states of Arizona and Nevada.

SYSTEM DESCRIPTION

As of this date, the final selection of ground stations in Montana has not been completed. However, Montana is scheduled for approximately thirty receive-only stations and one or two transmit and receive installations. Completion of ground installations is planned for November, 1973.

The Fairchild ATS-F satellite is scheduled for launch April 12, 1974 and to be operational by May 12, 1974. The ETD experiment is one of twenty-two experiments taking place on the satellite. Within the ETD portion, two video and eight associated audio channels in the 4 GHz and 6 GHz range will be broadcast to the Federation states. Thirty two high grade voice channels (2.5 GHz) will also be available.

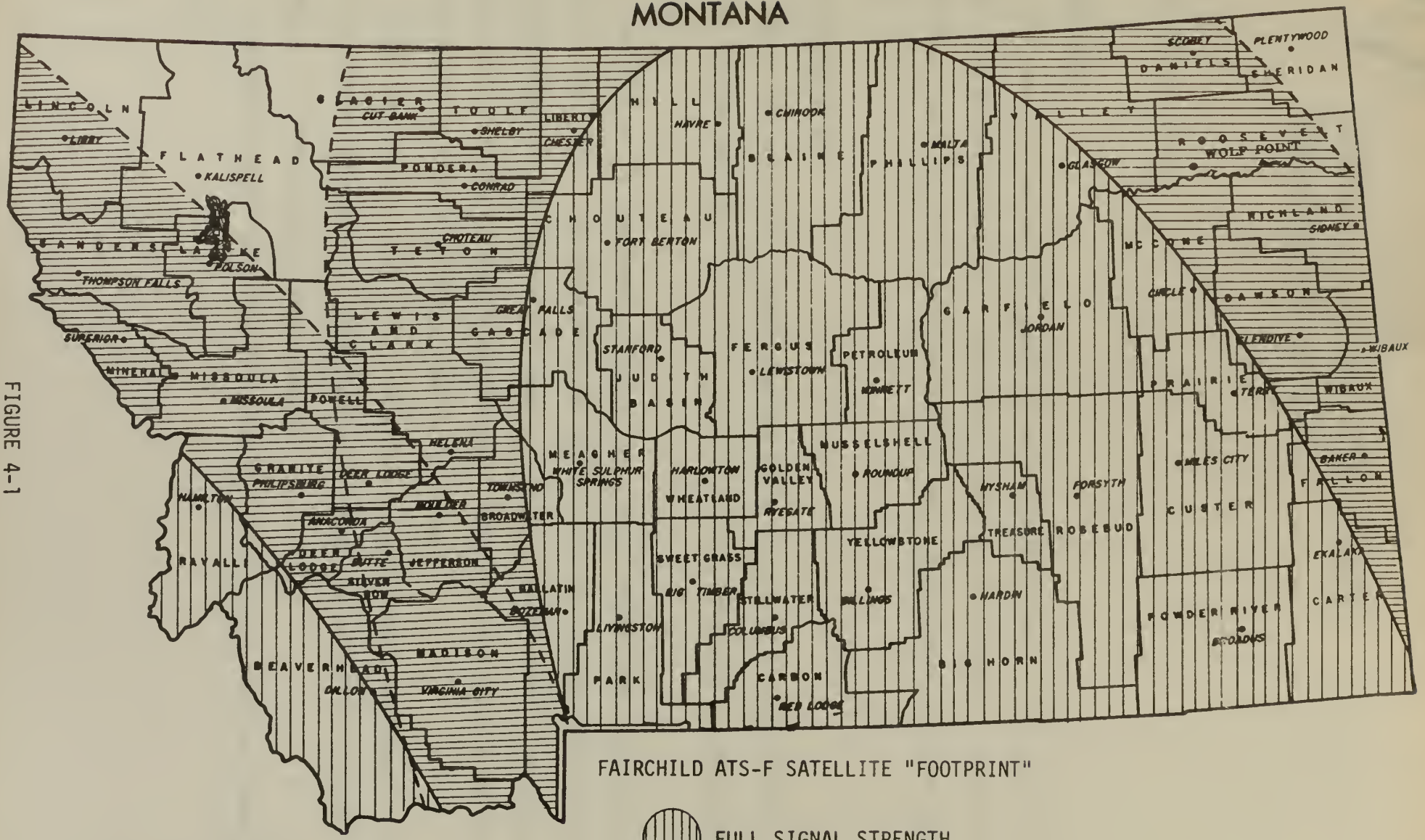
The satellite "footprint" or broadcast coverage area for Montana is shown in figure 4-1. Two hours of educational broadcast per day will be relayed via the satellite from the ETD center in Denver, Colorado.

Information concerning the ETD experiment and actual program structure is available from the Communications Bureau and the Office of the Superintendent of Public Instruction.

PLANS AND RECOMMENDATIONS

The Educational Technology Demonstration is an experiment, and a permanent educational television network is not guaranteed. However, a replacement satellite (ATS-G) is planned for launch in 1975 as the ATS-F satellite is only scheduled for a one-year operation over the Federation States.

MONTANA



FAIRCHILD ATS-F SATELLITE "FOOTPRINT"

FULL SIGNAL STRENGTH

RELIABLE 3db SIGNAL STRENGTH

FIGURE 4-1

No. 1052 — County Outline Map
STATE PUBLISHING COMPANY
Helena

January, 1973

UNIVERSITY SYSTEM

INTRODUCTION

Ten years ago technology experts predicted that television and other instructional aids would revolutionize the school system in this country. Today, television has proven itself as an effective and very powerful tool to higher education.

SYSTEM DESCRIPTION

Within the University System, Montana State University and the University of Montana are the only two institutions with television broadcast and recording facilities.

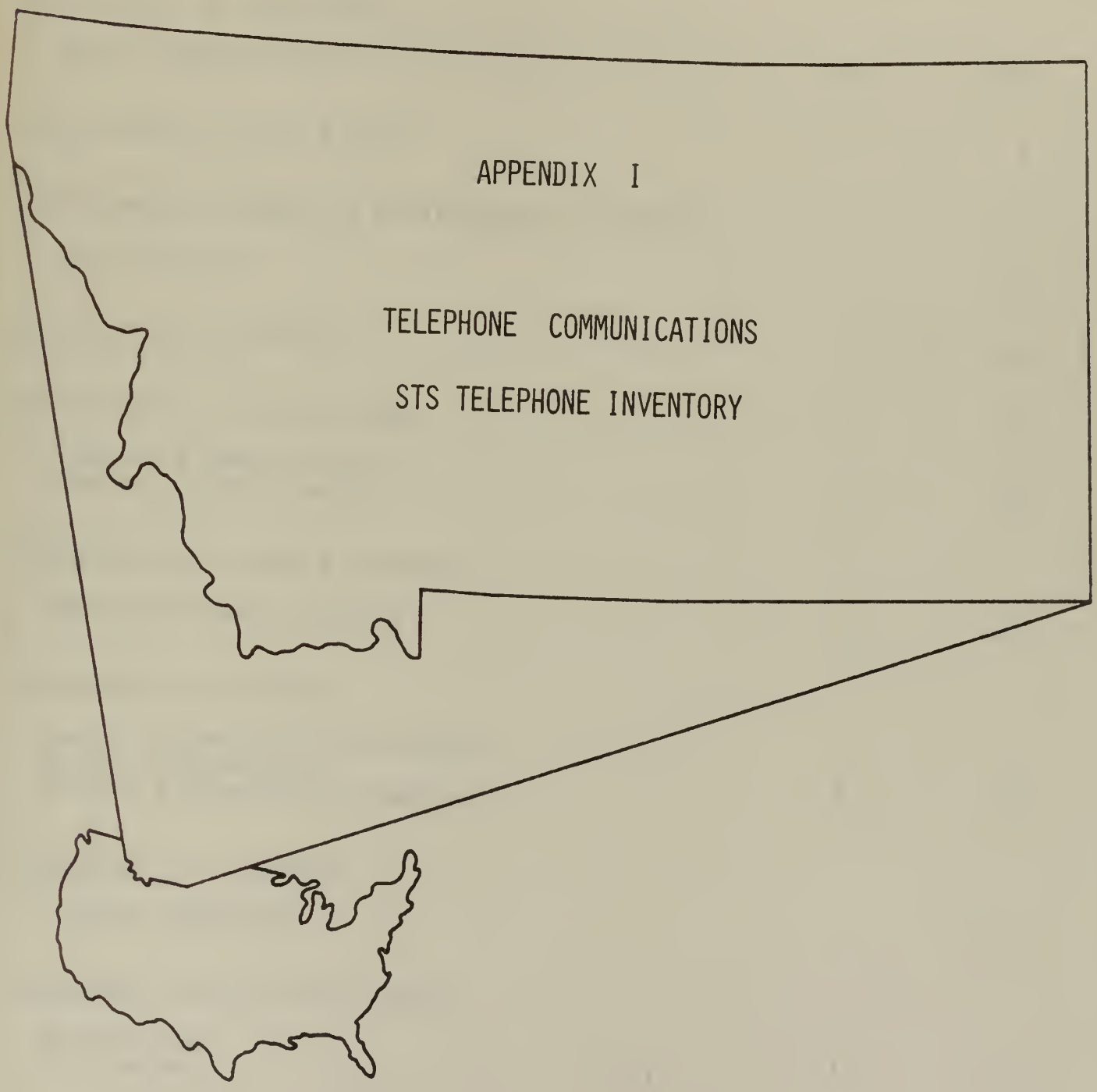
The Film and TV Department at MSU is the largest educational television installation in the State. The Department has capabilities for closed-circuit live and recorded broadcasts throughout the campus. Mobile video broadcasts can be handled through the TV Center. Programs originated at the Center can also be fed to the local cable TV system, providing coverage to Bozeman.

Video facilities at the U of M are primarily used within the School of Journalism as an instructional aid. Video-taped broadcasts can be carried through the campus on a limited closed circuit system.

Information concerning these installations is available from the Communications Bureau.

PLANS AND RECOMMENDATIONS

Expansion of these facilities is planned as funds are available. Both installations are presently limited to black and white broadcasts, conversion to color capability is hoped for the future.



APPENDIX I

TELEPHONE COMMUNICATIONS

STS TELEPHONE INVENTORY

BILLINGS

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF EDUCATION		
Eastern Montana College	68	165
DEPARTMENT OF FISH & GAME	1	9
DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES		
Health Services	1	0
DEPARTMENT OF HIGHWAYS	1	18
DEPARTMENT OF INSTITUTIONS	1	0
Probation & Parole Division	1	0
Warm Springs State Hospital	1	4
DEPARTMENT OF LABOR & INDUSTRY		
Employment Security Division	1	47
DEPARTMENT OF JUSTICE		
Bureau of Criminal ID & Investigation	1	0
Montana Highway Patrol	2	3
Governor's Crime Control Commission	1	0
DEPARTMENT OF LIVESTOCK		
Livestock Commission	1	0
DEPARTMENT OF MILITARY AFFAIRS		
National Guard	2	4
Civil Defense	1	1

BILLINGS (CONTINUED)

STS TELEPHONE INVENTORY

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF NATURAL RESOURCES & CONSERVATION		
Oil & Gas Conservation Division	1	4
DEPARTMENT OF SOCIAL & REHABILITATION SERVICES		
Rehabilitative Services Division	1	7
Welfare	1	7
BILLINGS TOTAL	86	269

BOULDER

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF INSTITUTIONS		
Boulder River School	21	4
DEPARTMENT OF SOCIAL & REHABILITATION SERVICES		
Rehabilitative Services Division	1	0
BOULDER TOTAL	22	4

BOZEMAN

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF AGRICULTURE		
Feed & Fertilizer Division	2	4
DEPARTMENT OF EDUCATION		
Montana State University	140	183
DEPARTMENT OF FISH & GAME	1	6
DEPARTMENT OF HIGHWAYS	2	6
DEPARTMENT OF INSTITUTIONS		
Board of Pardons	1	0
DEPARTMENT OF LABOR & INDUSTRY		
Employment Security Division	1	11
DEPARTMENT OF LIVESTOCK		
Livestock Commission	1	4
DEPARTMENT OF MILITARY AFFAIRS		
National Guard	1	5
BOZEMAN TOTAL	149	219

BUTTE

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF EDUCATION		
College of Mineral Sciences & Technology	33	6
DEPARTMENT OF HIGHWAYS	2	17
DEPARTMENT OF INSTITUTIONS	1	0
DEPARTMENT OF LABOR & INDUSTRY		
Employment Security Division	2	13
DEPARTMENT OF JUSTICE		
Montana Highway Patrol	1	5
DEPARTMENT OF SOCIAL & REHABILITATION SERVICES		
Rehabilitative Services Division	1	1
Welfare	1	6
BUTTE TOTAL	41	48

DEER LODGE

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF INSTITUTIONS		
Montana State Prison	52	32
Board of Pardons	1	0
DEPARTMENT OF MILITARY AFFAIRS		
National Guard	1	0
DEER LODGE TOTAL	54	32

GALEN

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF INSTITUTIONS		
Galen State Hospital	30	8
GALEN TOTAL	30	8

GREAT FALLS

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF AGRICULTURE		
Wheat Research & Marketing	1	1
Grain Division	1	2
DEPARTMENT OF EDUCATION		
School for Deaf & Blind	1	9
DEPARTMENT OF FISH & GAME	1	8
DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES		
Health Services	1	8
DEPARTMENT OF HIGHWAYS	2	20
DEPARTMENT OF INSTITUTIONS		
Probation & Parole Division	1	0
Warm Springs State Hospital	1	0
DEPARTMENT OF LABOR & INDUSTRY		
Employment Security Division	1	7
DEPARTMENT OF JUSTICE		
Attorney General	1	1
Highway Patrol	1	3

GREAT FALLS (CONTINUED)

STS TELEPHONE INVENTORY

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF MILITARY AFFAIRS		
National Guard	42	3
Civil Defense	1	0
DEPARTMENT OF SOCIAL & REHABILITATION SERVICES		
Rehabilitative Services Division	1	6
Welfare	1	9
GREAT FALLS TOTAL	57	77

HAVRE

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF EDUCATION		
Northern Montana College	19	26
DEPARTMENT OF HIGHWAYS	1	5
DEPARTMENT OF INSTITUTIONS		
Aftercare Division	1	0
Board of Pardons	1	0
DEPARTMENT OF SOCIAL & REHABILITATION SERVICES		
Rehabilitative Services Division	1	0
HAVRE TOTAL	23	31

HELENA

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF ADMINISTRATION	26	37
Data Processing Bureau	5	1
Board of Examiners	1	1
Public Employee's Retirement Division	2	6
Teachers Retirement Division	3	4
Merit System Council	1	3
Public Employees Retirement Division Social Security Bureau	1	2
DEPARTMENT OF AGRICULTURE	5	9
DEPARTMENT OF BUSINESS REGULATIONS	3	11
DEPARTMENT OF EDUCATION		
Library Commission	4	18
University System	3	7
Vocational Education	1	1
Historical Society	3	16
DEPARTMENT OF FISH & GAME	67	22
DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES	43	127
DEPARTMENT OF HIGHWAYS	160	126
DEPARTMENT OF INSTITUTIONS	6	8
Board of Pardons	1	25
Drug Program	1	0

HELENA (CONTINUED)

STS TELEPHONE INVENTORY

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF INTERGOVERNMENTAL REGULATIONS	2	6
Highway Traffic Safety	2	4
Economic Opportunity	5	11
Aeronautics Commission	4	13
Planning & Economic Development	20	43
Municipal Division	2	2
DEPARTMENT OF JUSTICE		
Attorney General	8	10
Montana Board of Crime Control	5	15
Highway Patrol	6	23
Law Enforcement Teletype System	5	7
DEPARTMENT OF LABOR AND INDUSTRY		
Employment Security Division	72	35
Labor Standards Division	5	10
Workmen's Compensation Division	15	37
DEPARTMENT OF LIVESTOCK		
Animal Health Division	2	6
Brands-Enforcement Division	3	6
DEPARTMENT OF MILITARY AFFAIRS	32	31
Civil Defense	2	10
DEPARTMENT OF NATURAL RESOURSES & CONSERVATION	8	40
State Conservation	1	2
Oil & Gas Regulating	1	1
Forest Management Program	2	2
DEPARTMENT OF PROFESSIONAL & OCCUPATIONAL LICENSING	4	12
Board of Electricians	2	0
DEPARTMENT OF PUBLIC SERVICE REGUALTIONS	18	0

HELENA (CONTINUED)

STS TELEPHONE INVENTORY

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF REVENUE	26	30
Liquor Control Division	4	13
DEPARTMENT OF SOCIAL & REHABILITATION SERVICE		
Commission on Aging	3	4
Rehabilitative Services Division (Vocational Rehab)	8	20
Veteran's Welfare	2	1
Public Welfare	32	53
DEPARTMENT OF STATE LANDS	4	19
GOVERNORS OFFICE	6	11
Manpower Planning	2	2
Executive Reorganization	2	2
Federal State Coordinator	2	0
Community Child Care Council (CCCC)	2	1
SECRETARY OF STATE	3	11
STATE AUDITOR	8	20
Hail Insurance	1	1
STATE TREASURER	2	4
SUPERINTENDENT OF PUBLIC INSTRUCTION	91	71
SUPREME COURT	7	9
LEGISLATIVE AUDITOR	3	8

HELENA (CONTINUED)

STS TELEPHONE INVENTORY

	MAIN STATIONS	EXTENSIONS
LEGISLATIVE COUNCIL	1	3
ENVIRONMENTAL QUALITY COUNCIL	2	0
DISTRICT JUDGES	2	0
LEWIS & CLARK COUNTY ATTORNEY	1	0
HELENA TOTAL	777	1033

KALISPELL

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF FISH & GAME	1	6
DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES		
Health Services	1	0
DEPARTMENT OF HIGHWAYS	1	11
DEPARTMENT OF INSTITUTIONS		
Aftercare Division	1	0
Board of Pardons	1	0
DEPARTMENT OF MILITARY AFFAIRS		
National Guard	2	5
DEPARTMENT OF NATURAL RESOURCES & CONSERVATION		
Forestry Division	1	3
DEPARTMENT OF SOCIAL & REHABILITATION SERVICES		
Rehabilitative Services Division	1	0
KALISPELL TOTAL	9	25

MILES CITY

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF FISH & GAME	1	9
DEPARTMENT OF HIGHWAYS	1	7
DEPARTMENT OF INSTITUTIONS	1	1
Board of Pardons	1	1
DEPARTMENT OF MILITARY AFFAIRS		
Civil Defense	1	0
DEPARTMENT OF SOCIAL & REHABILITATION SERVICES		
Rehabilitative Services Division	1	0
Welfare	1	4
MILES CITY TOTAL	7	22

MISSOULA

STS TELEPHONE INVENTORY

AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF EDUCATION		
University of Montana	254	189
DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES		
Health Services	1	0
DEPARTMENT OF HIGHWAYS	2	17
DEPARTMENT OF INSTITUTIONS	1	0
Probation & Parole Division	1	0
Warm Springs State Hospital	1	9
DEPARTMENT OF LABOR & INDUSTRY		
Employment Security Division	1	25
DEPARTMENT OF JUSTICE		
Board of Criminal ID & Investigation	2	1
Montana Highway Patrol	2	3
Governor's Crime Control Commission	1	0
DEPARTMENT OF MILITARY AFFAIRS		
National Guard	1	7
Civil Defense	1	0
DEPARTMENT OF NATURAL RESOURCES & CONSERVATION		
Forestry Division	1	22

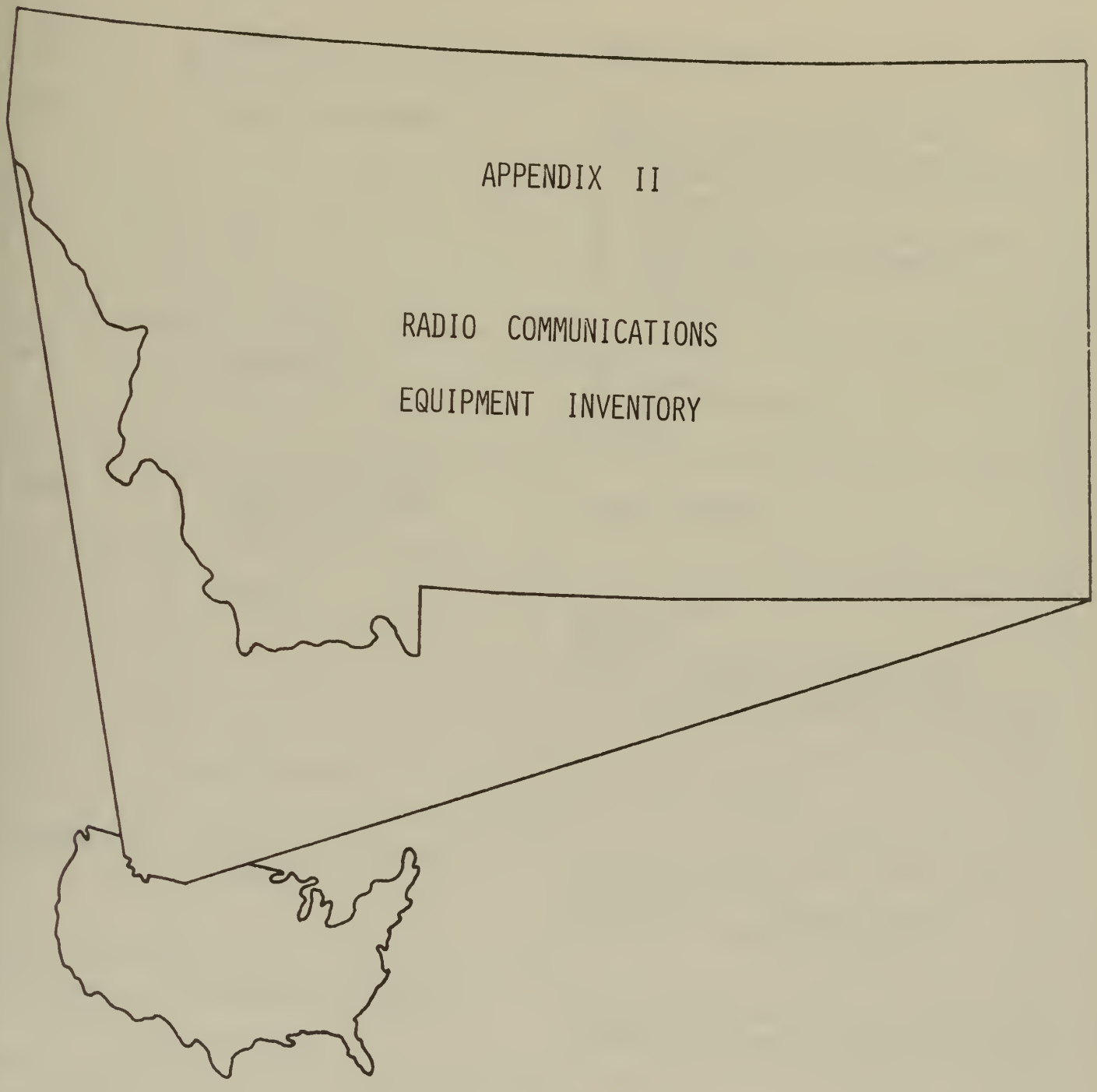
MISSOULA (CONTINUED)

STS TELEPHONE INVENTORY

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF SOCIAL & REHABILITATION SERVICES		
Rehabilitative Services Division	1	0
Welfare	1	8
MISSOULA TOTAL	271	281

WARM SPRINGS
STS TELEPHONE INVENTORY
AS OF 4/2/73

	MAIN STATIONS	EXTENSIONS
DEPARTMENT OF FISH & GAME	1	0
DEPARTMENT OF INSTITUTIONS		
Warm Springs State Hospital	34	25
WARM SPRINGS TOTAL	35	25



APPENDIX II

RADIO COMMUNICATIONS EQUIPMENT INVENTORY

APPENDIX II

ABBREVIATIONS USED

HEADING	EXPLANATION	ABBREVIATIONS USED
QUANT	quantity	number of units
TYPE	type of equipment	BRC-base station, radio control RCL-radio control link, immediately following associated base station REP-repeater BLL-base station, land line control BLC-base station, local control M - mobile radio P - portable radio
MFG	manufacturer	MOT-Motorola GE -General Electric RCA-RCA
POWER	transmitter output power	power in WATTS
ANT	antenna	gain-height examples: 3db20 - 3db gain, 20 foot height S10 - unity gain, 10 foot height S - unity gain, standard installation
AGE	age of units	age given in years
FREQUENCIES	operating frequencies in MHz	for REP and RCL installations, frequencies listed as; transmitter: T-frequency (MHz) receiver: R-frequency (MHz)
LOCATION	location of equipment	location given only for base stations, repeaters and radio control equipment.

EQUIPMENT INVENTORY - RADIO
DEPARTMENT OF FISH & GAME

COMMUNICATIONS BUREAU
DATE November 17, 1972

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	BLC	MOT	50	S32	1	39.82	39.74			F&G. HQ, Billings
2	M	GE	100	S	6	39.82	39.74			
4	M	MOT	50	S	4	39.82	39.74			
4	M	MOT	50	S	13	39.82				
14	M	MOT	50	S	11	39.82	39.74			
21	M	MOT	30	S	10	39.82	39.74			
6	M	MOT	50	S	10	39.82	39.74			
4	M	RCA	100	S	1	39.82	39.74			
9	M	RCA	100	S	2	39.82	39.74			
24	M	MOT	30	S	12	39.82	39.74			
10	P	MOT	1.5	S	1	39.82	39.74			
NOTE: Approximately 8 very old mobiles - 39.74 MHz - in service at selected Fish and Game installations										

EQUIPMENT INVENTORY - RADIO

DEPARTMENT OF HIGHWAYS - Page 1

COMMUNICATIONS BUREAU

DATE November 1, 1972

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	BRC	GE	330	3db95	8	47.04				McDonald Pass
1	RCL	GE	30	3db15	8	T-72.66	R-157.05			McDonald Pass
1	RCL	GE	60	6db35	8	T-157.05	R-72.66			Helena
1	BLL	GE	330	3db75	8	47.04				University Mtn, Msla
1	BRC	MOT	60	3db45	17	47.04				Clark Pk,Thompson Fls
1	RCL	MOT	60	9db45	17	T-156.99	R-161.79			Clark Pk,Thompson Fls
1	RCL	MOT	60	9db75	17	T-161.79	R-156-94			Missoula
1	BLC	GE	30	3db5	16	47.04				Lolo Hot Springs
1	BLC	GE	60	3db20	7	47.04				Lost Trail Pass
1	BLC	GE	60	3db75	16	47.04				Saltese
1	BRC	GE	100	3db50	8	47.04				Blue Mountain
1	RCL	MOT	70	9db40	5	T-156.99	R-161.79			Blue Mountain
1	RCL	RCA	60	9db30	1	T-161.79	R-156.99			Kalispell
1	BLC	MOT	30	3db20	10	47.04				Libby
1	BLC	MOT	30	3db50	10	47.04				Summit
1	BRC	GE	50	3db70	1	47.04				Big Mountain
1	RCL	GE	18	10db30	1	T-453.00	R-458.00			Big Mountain
1	RCL	GE	15	10db30	1	T-458.00	R-453.00			Kalispell
1	BLL	MOT	330	3db45	6	47.04				Butte- XL Heights
1	BRC	GE	100	3db40	8	47.04				Dillon- Pipe Organ
1	RCL	MOT	50	6db40	9	T-161.79	R-156.99			Dillon- Pipe Organ
1	RCL	MOT	60	6db45	9	T-156.99	R-161.79			Butte- XL Heights
1	BLL	MOT	330	3db60	6	47.04				Bozeman
1	BLC	GE	100	3db45	8	47.04				W.Yellowstone-Duck Ck
1	BRC	GE	100	3db20	8	47.04				Belt Butte

EQUIPMENT INVENTORY - RADIO
DEPARTMENT OF HIGHWAYS - Page 2

COMMUNICATIONS BUREAU
DATE November 1, 1972

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	RCL	MOT	10	6db20	2	T-453.20	R-458.20			Belt Butte
1	RCL	GE	18	6db20	2	T-458.20	R-453.20			Great Falls
1	BRC	GE	330	3db35	11	47.04				Mount Royal
1	RCL	GE	30	S45	6	T-156-99	R-161.79			Mount Royal
1	RCL	MOT	30	6db45	6	T-161-79	R-156-99			Havre
1	RCL	MOT	30	6db20	15	T-161.79	R-156.99			Shelby
1	BLC	MOT	30	3db20	9	47.04				Browning
1	BLC	GE	60	3db15	8	47.04				St. Mary's
1	BLL	MOT	330	3db100	6	47.04				Glendive
1	BLL	MOT	330	3db300	5	47.04				Wolf Point
1	BRC	MOT	120	3db55	6	47.04				Plentywood
1	RCL	MOT	120	10db55	6	T-156.99	R-161.79			Plentywood
1	RCL	MOT	120	10db205	6	T-161.79	R-156.99			Wolf Point
1	BRC	GE	60	3db145	1	47.04				Saco
1	RCL	GE	30	9db145	1	T- 72.26	R- 75.62			Saco
1	RCL	GE	30	9db50	1	T- 75.62	R- 72.26			Fort Peck W
1	RCL	GE	30	9db50	1	T- 75.42	R- 72.42			Fort Peck E
1	RCL	GE	30	9db26	1	T- 72.42	R- 75.42			Wolf Point
1	BRC	GE	60	3db30	1	47.04				Red Lodge
1	RCL	GE	30	9db30	1	T-453.00	R-458.00			Red Lodge
1	RCL	GE	30	9db30	1	T-458.00	R-453.00			Billings
1	BRC	RCA	100	3db45	2	47.04				Hardin
1	RCL	RCA	60	6db45	2	T-156.99	R-161.79			Hardin
1	RCL	MOT	30	6db145	5	T-161.79	R-156.99			Billings
1	BLL	MOT	330	3db60	6	47.04				Miles City

EQUIPMENT INVENTORY - RADIO
DEPARTMENT OF HIGHWAYS - Page 3

COMMUNICATIONS BUREAU
DATE November 1, 1972

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	BRC	MOT	120	3db120	6	47.04				Home Creek
1	RCL	MOT	30	10db25	6	T-156.99	R-161.79			Home Creek
1	RCL	MOT	30	10db20	6	T-161.79	R-156.99			Miles City
1	BLC	MOT	30	3db5	10	47.04				Missouri Rvr Bridge
1	BLC	MOT	30	3db40	10	47.04				Deep Creek
1	BRC	GE	330	3db70	11	47.04	47.16			Moccasin Mountain
1	RCL	GE	30	6db70	21	T-156.99	R-161.79			Moccasin Mountain
1	RCL	MOT	30	S12	6	T-161.79	R-156.99			Lewistown
1	BRC	GE	50	3db35	0	47.04				Baker
1	RCL	MOT	45	6db20	0	T-151.230	R-159.195			Baker
1	RCL	MOT	45	6db50	0	T-159.195	R-151.130			Glendive
1	BLC	GE	100		16	47.04	47.16			Spare
1	BLC	MOT	60		17	47.04				Spare
2	RCL	MOT	60		17					Spare
2	RCL	MOT	30		21					Spare
2	M	MOT	12	S	14	47.04				
74	M	MOT	50	S	10	47.04				
20	M	MOT	50	S	9	47.04				
54	M	GE	100	S	8	47.04				
44	M	MOT	50	S	6	47.04				
46	M	MOT	60	S	5	47.04				
51	M	MOT	60	S	2	47.04				
2	M	RCA	40	S	2	47.04				
40	M	GE	100	S	1	47.04				

EQUIPMENT INVENTORY - RADIO

DEPARTMENT OF HIGHWAYS - Page 4

COMMUNICATIONS BUREAU

DATE November 1, 1972

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	M	MOT	100	S	10	47.04	47.16			
3	M	MOT	50	S	9	47.04	47.16			
1	M	GE	50	S	2	47.04	47.16			
2	M	RCA	40	S	2	47.04	47.16			
2	M	MOT	5	S	1	47.04	47.16			
23	M	GE	100	S	1	47.04	47.16			
4	M	MOT	5	S	1	47.04	47.16			
2	M	MOT	50	S	6	39.82	39.92			
43	M	GE	50	S	0	47.04	47.16	47.10		
1	M	GE	50	S	0	47.04	47.16	47.10		
1	M	GE	50	S	1	47.04	47.16	47.10	47.08	
20	M	GE	50	S	1	47.04	47.16	47.10	47.08	
4	M	MOT	50							Spare
4	M	GE	30							Spare
11	P	RCA	2.2	S	2	47.04	47.16			
15	P	MOT	1.5	S	0	47.04	47.16			

EQUIPMENT INVENTORY - RADIO
DEPARTMENT OF INSTITUTIONS

COMMUNICATIONS BUREAU
DATE April 1, 1973

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	BLL	MOT	100	S	3	39.82	39.68			Montana State Prison
7	M	MOT	100	S	3	39.82	39.68	39.88		Deer Lodge
2	M	MOT	100	S	5	39.82	39.68	39.88		
2	P	MOT	1.5	5	3	39.82	39.68			
2	P	MOT	1.5	S	2	39.82	39.68			
6	M	GE	50	S	1	39.82	39.88			Pine Hills School
1	BLC	MOT	45	5db20	new	155.925				Mountain View School
6	M	MOT	30	S	new	155.925				
3	P	MOT	1.5	S	new	155.925				
15	M	GE	100	S	1	39.82	39.88	39.86		Board of Pardons

EQUIPMENT INVENTORY - RADIO

DEPARTMENT OF JUSTICE PAGE 1

MONTANA HIGHWAY PATROL

COMMUNICATIONS BUREAU

DATE December 22, 1972

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	BRC	GE	100	S100	5	39.82	39.92			Mac Donald Pass
	RCL	GE	30	6db40	5	T-154.920	R-159.150			Mac Donald Pass
	RCL	GE	30	6db18	5	T-159.150	R-154.920			Helena - H.P.
1	BLL	MOT	100	S35	4	39.82	39.92			Butte - H.P.
1	BLL	MOT	100	3db100	4	39.82	39.92			Billings - H.P.
1	BLL	MOT	100	S65	4	39.82	39.92			Glendive - H.P.
1	BLL	MOT	100	S100	4	39.82	39.92			Missoula - H.P.
1	BLL	MOT	100	S60	4	39.82	39.92			Great Falls - H.P.
92	M	MOT	50	5	9	39.82	39.92			
12	M	GE	100	5	4mo.	39.82	39.92	39.86	39.88	
30	M	GE	100	5	2	39.82	39.92			
35	M	GE	100	5	1	39.82	39.92	39.86	39.88	
15	M	RCA	50	5	4	39.82	39.92			
30	M	RCA	50	5	3	39.82	39.92	39.86	39.88	

EQUIPMENT INVENTORY - RADIO
DEPARTMENT OF JUSTICE PAGE 2

COMMUNICATIONS BUREAU
DATE March 1, 1973

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	BLL	GE	100W	S	new	39.82	39.88			Registrar of Motor
										Vehicles,
										Deer Lodge
1	M	Poly CO	25	S	10	39.82				MLETS
2	M	G.E.	100	S	6	39.82	39.92			
2	M	MOT	100	S	4	39.82	OPEN			Criminal Investiga-
2	P	MOT	1.5	S	7	39.82	OPEN			tors
4	M	MOT	100	S	new	39.82	39.86	39.88	OPEN	Fire Marshall
1	M	MOT	40	S	8	39.82				

EQUIPMENT INVENTORY - RADIO

COMMUNICATIONS BUREAU

DEPARTMENT OF LIVESTOCK

Brands-Enforcement Division

DATE October 27, 1972

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	BLC	GE	100	S20	1	39.82	39.78			9 mi. E of Billings
4	M	GE	100	S	0	39.82	39.86	39.88	39.78	
1	M	GE	100	S	7	39.82	39.78			
2	M	GE	100	S	1	39.82	39.78			
11	M	MOT	60	S	10	39.82	39.78			
1	M	GE	60	S	12	39.82	39.78			
2	P	MOT	5	S	3	39.82	39.78			
2	P	MOT	1.4	S	4	39.82	39.78			

EQUIPMENT INVENTORY - RADIO

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

DIVISION OF FORESTRY - Page 1

COMMUNICATIONS BUREAU

DATE April 1, 1973

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
1	BLL	MOT	100	S23	14	31.26				Mt. Sentinel, Msla
1	BRC	MOT	120	S35	4	31.26				Big Mountain, Kal
1	RCL	MOT	70	S25	3	T-159.33	R-171.75			Big Mountain, Kal
1	RCL	MOT	20	3db15	3	T-171.475	R-159.33			Kalispell
1	BLC	MOT	60	S60	10	31.26				Goat Creek Office
1	BLC	MOT	60	S45	10	31.26				Stillwater Office
1	BRC	MOT	120	S50	6	31.26				Mac Donald Pass
1	RCL	MOT	70	3db30	7	T-151.475	R-159.405			Mac Donald Pass
1	RCL	MOT	60	3db10	7	T-159.405	R-151.475			Helena
1	BLL	MOT	100	S20	4	31.26				Anaconda, 10m.W.
1	BLC	MOT	100	S20	4	31.26				Swan Forest Camp
1	BRC	MOT	250	S30	20	31.14				Blacktail Mountain
1	RCL	MOT	60	3db20	15	T-159.240	R-151.475			Blacktail Mountain
1	RCL	MOT	25	3db15	15	T-151.475	R-159.240			Kalispell
1	BLC	MOT	30	5db35	0	151.475	151.175	151.220		Clearwater Junction
1	BLC	MOT	60	3db20	14	151.475	151.175			Garrison
1	REP	MOT	100	5db85	1	T-151.175	R-151.475			Belmont Pk-repeater
1	BLL	MOT	100	5db85	1	151.475	151.175			Mt. Sentinel,Milltn
1	BLC	MOT	100	5db30	1	T-151.475	R-151.175			Helena
1	REP	MOT	45	S10	1	T-151.175	R-151.475			Union Peak-repeater
1	BLL	MOT	100	5db20	new	151.475	151.175	151.220		Anaconda, 10 m.w.
2	M	MOT	45	3db	new	151.475	151.175	151.220		
6	M	MOT	100	S	1	151.475	151.175	151.220		
20	M	MOT	45	3db	1	151.475	151.175	151.220		

EQUIPMENT INVENTORY - RADIO

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

DIVISION OF FORESTRY - Page 2

COMMUNICATIONS BUREAU

DATE April 1, 1973

QUANT	TYPE	MFG	POWER	ANT	AGE	FREQUENCIES F1	F2	F3	F4	LOCATION
3	M	MOT	60	S	14	31.14				
17	M	MOT	60	S	10	31.26				
1	M	GE	60	S	5	31.14				
17	M	MOT	100	S	6	31.26				
5	P	MOT	5	S	5	31.14	31.26			
25	P	MOT	5	S	10	31.26				
31	P	MOT	5	S	1	151.475	151.175	151.220		
5	P	MOT	5	S	1	151.475	151.175	151.220		
3	P	MOT	5	S	new	151.475	151.175	151.220		

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF ADMINISTRATION — COMMUNICATIONS BUREAU

DATA PROCESSING BUREAU — DATE March 1, 1973

COMPUTER	IBM 370/135
CORE MEMORY	60K words (240K bytes)
DISC MEMORY	12 disc. drives, 348 M bytes
MAGNETIC TAPE MEMORY	7 tape drives, 9 track - 1600 bytes/inch
TELECOMMUNICATIONS PORTS	Integrated Communications Adapter 9 switched, 2 dedicated
TRANSMISSION RATES	150 and 1200 baud, asynchronous
PERIPHERALS	

2 card readers, 1000 and 600 cards/minute.

1 card punch, 200 cards/minute

1 line printer, 1100 lines/minute

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

University System - E.M.C. — DATE March 1, 1973

COMPUTER	IBM 360/20 submodel 5
CORE MEMORY	4K words (16K bytes)
DISC MEMORY	10.8 M bytes
MAGNETIC TAPE MEMORY	none
TELECOMMUNICATIONS PORTS	none
TRANSMISSION RATES	110 and 150 baud
PERIPHERALS	

1 card reader, 500 cards/minute

1 card punch, 200 cards/minute

1 line printer, 350 lines/minute

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

UNIVERSITY SYSTEM - MSU (computer center) — DATE March 1, 1973

COMPUTER	XDS Sigma 7
CORE MEMORY	96K words (384K bytes)
DISC MEMORY	116.3 M bytes
MAGNETIC TAPE MEMORY	3 drives, 9 track 800 bytes/inch
TELECOMMUNICATIONS PORTS	24 ports to data switches 8 ports dedicated
TRANSMISSION RATES	110,300 and 1200 baud, asynchronous
PERIPHERALS	

2 card readers, 1500 and 200 cards/minute

1 card punch, 60 to 200 cards/minute

1 drum plotter

2 line printers, 1500 and 1000 lines/minute

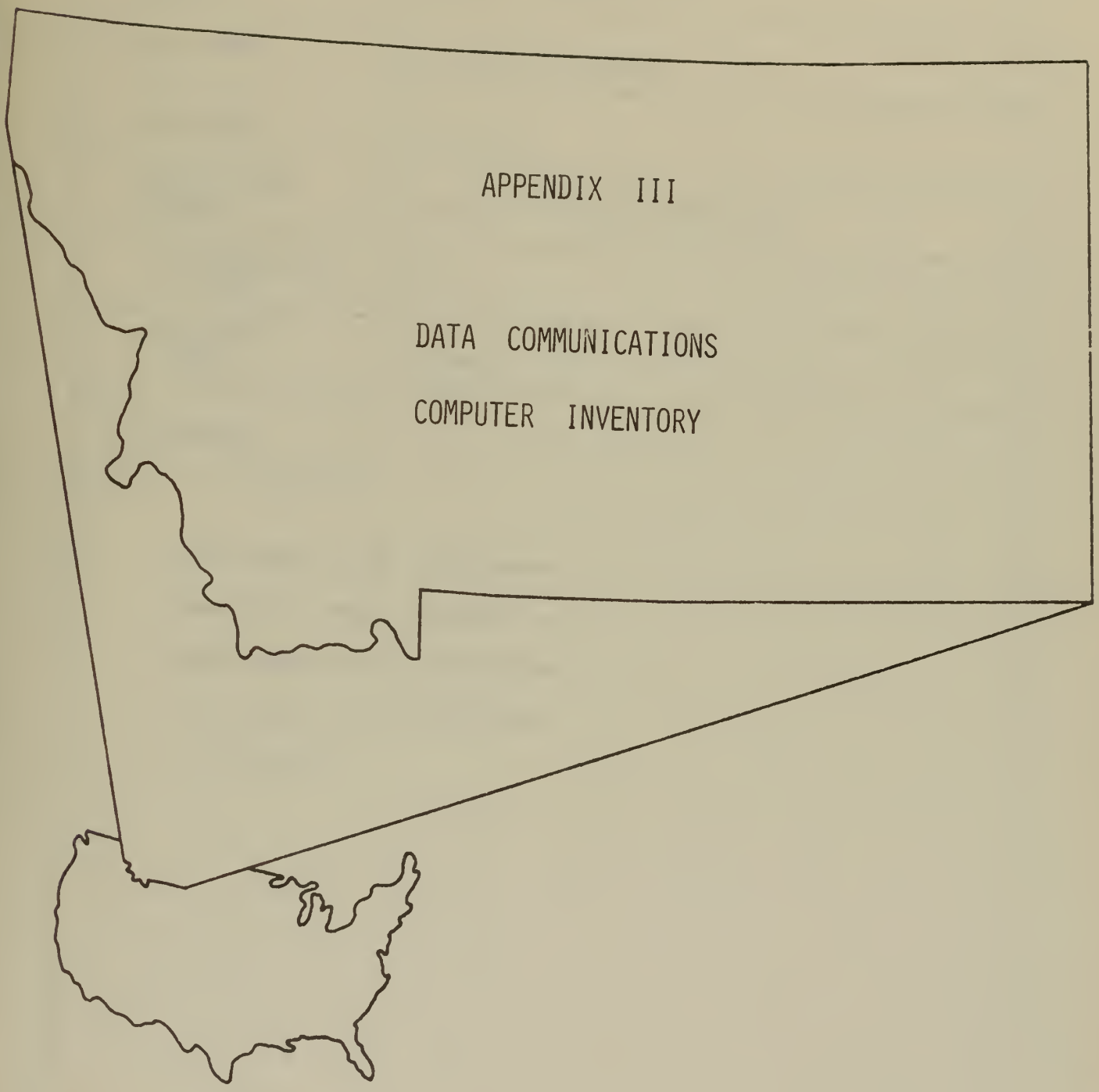
EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

UNIVERSITY SYSTEM - M.S.U. (Engineering Research) — DATE March 1, 1973

COMPUTER	Hewlett - Packard 2115 A
CORE MEMORY	8K words (16K bytes)
DISC MEMORY	none
MAGNETIC TAPE MEMORY	none
TELECOMMUNICATIONS PORTS	none
TRANSMISSION RATES	110 baud
PERIPHERALS	

none



APPENDIX III

DATA COMMUNICATIONS

COMPUTER INVENTORY

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

UNIVERSITY SYSTEM - M.S.U. (Engineering Research) — DATE March 1, 1973

COMPUTER	Hewlett - Packard 2116 B
CORE MEMORY	16K words (32K bytes)
DISC MEMORY	2.4 M bytes
MAGNETIC TAPE MEMORY	1 drive, 7 track 556 bytes/inch
TELECOMMUNICATIONS PORTS	none
TRANSMISSION RATES	110 baud
PERIPHERALS	

1 card reader, 1100 cards/minute

1 paper tape reader, 300 char/sec.

1 paper tape punch, 120 char/sec.

1 line printer, 600 lines/minute

1 X-Y recorder

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

UNIVERSITY SYSTEM - M.S.U. (Engineering Research) — DATE March 1, 1972

COMPUTER	Hewlett - Packard 2116A
CORE MEMORY	8K words (16K bytes)
DISC MEMORY	none
MAGNETIC TAPE MEMORY	none
TELECOMMUNICATIONS PORTS	none
TRANSMISSION RATES	110 baud
PERIPHERALS	

none

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

UNIVERSITY SYSTEM - MONTANA TECH. — DATE March 1, 1973

COMPUTER	IBM 1620
CORE MEMORY	6K words (60K bytes)
DISC MEMORY	4 M bytes
MAGNETIC TAPE MEMORY	none
TELECOMMUNICATIONS PORTS	none
TRANSMISSION RATES	110 baud
PERIPHERALS	

1 card reader, 500 cards/minute

1 card punch, 250 cards/minute

1 line printer, 150 lines/minute

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

UNIVERSITY SYSTEM - N. M. C. — DATE March 1, 1973

COMPUTER	Hewlett - Packard 2114
CORE MEMORY	8K words (16K bytes)
DISC MEMORY	none
MAGNETIC TAPE MEMORY	none
TELECOMMUNICATIONS PORTS	none
TRANSMISSION RATES	110 baud
PERIPHERALS	

1 card reader, 150 cards/minute

1 paper tape punch, 120 char./sec.

1 paper tape reader, 300 char./sec.

1 line printer

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

UNIVERSITY SYSTEM - U of M — DATE March 1, 1973

COMPUTER	DEC PDP 10
CORE MEMORY	96K words (480K bytes)
DISC MEMORY	75 M bytes
MAGNETIC TAPE MEMORY	3 drives, 9 track 1600 bytes/inch
TELECOMMUNICATIONS PORTS	8 ports to data switches 16 ports dedicated
TRANSMISSION RATES	110 and 1200 baud, asynchronous
PERIPHERALS	

1 card reader, 1000 cards/minute

1 card punch, 200 cards/minute

1 paper tape reader, 300 char/sec.

1 paper tape punch, 50 char/sec.

1 line printer, 1500-2000 lines/minute

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF EDUCATION — COMMUNICATIONS BUREAU

UNIVERSITY SYSTEM U of M — DATE March 1, 1973

COMPUTER	DEC PDP 11/20
CORE MEMORY	8K words (16K bytes)
DISC MEMORY	130 K bytes
MAGNETIC TAPE MEMORY	DEC Tape, 294K bytes
TELECOMMUNICATIONS PORTS	none
TRANSMISSION RATES	110 baud
PERIPHERALS	

1 line printer

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF HIGHWAYS — COMMUNICATIONS BUREAU

DATA PROCESSING BUREAU — DATE March 1, 1973

COMPUTER	IBM 360/40
CORE MEMORY	64K words (256K bytes)
DISC MEMORY	319 M bytes
MAGNETIC TAPE MEMORY	4 drives, 9 track 1600 bytes/inch
TELECOMMUNICATIONS PORTS	10 ports
TRANSMISSION RATES	135 baud, asynchronous
PERIPHERALS	

1 card reader, 1000 cards/minute

1 card punch, 200 cards/minute

1 drum plotter

1 line printer, 1100 lines/minute

EQUIPMENT INVENTORY - COMPUTER

DEPARTMENT OF JUSTICE — COMMUNICATIONS BUREAU

MLETS — DATE April 1, 1973

COMPUTER	Action Telecontroller Data General 1200
CORE MEMORY	20K words (40K bytes)
DISC MEMORY	8 M bytes
MAGNETIC TAPE MEMORY	none
TELECOMMUNICATIONS PORTS	5 ports
TRANSMISSION RATES	110 and 1200 baud
PERIPHERALS	

1 line printer

EQUIPMENT INVENTORY - COMPUTER

SUPERINTENDENT OF PUBLIC INSTRUCTION — COMMUNICATIONS BUREAU

DATA PROCESSING SERVICES — DATE March 1, 1973

COMPUTER	Honeywell 2000
CORE MEMORY	9K words (36K bytes)
DISC MEMORY	9.2 M bytes
MAGNETIC TAPE MEMORY	4 drives, 7 track 650 bytes/inch
TELECOMMUNICATIONS PORTS	none
TRANSMISSION RATES	110 baud
PERIPHERALS	

1 card reader, 650 cards/minute

1 line printer, 900 lines/minute